Medium Voltage Distribution

GMA

Gas-Insulated Switchgear up to 24 kV

Operating Instructions
Technical manual

No. AGS 531 521-01
Edition 03/2009

www.schneider-electric.com

Schneider Electric

Schneider Electric
35, rue Joseph Monier
CS 30323
92506 Rueil-Malmaison Cedex, France

www.schneider-electric.com

Manufacturer:
Schneider Electric Sachsenwerk GmbH

Service:
Should you have any queries as to our service, please contact:
Schneider Electric Sachsenwerk GmbH

© Schneider Electric
All rights reserved to this technical instruction.
Reproduction and making available of this technical instruction, or extracts, to third parties are prohibited.
Only integral reproduction of this technical instruction is permitted with the written permission from Schneider Electric Energietechnik GmbH – Sachsenwerk Medium Voltage.
Electronic copies in e.g. PDF-format or scanned version have the status “for information only” .
The only valid version of technical Instructions are always enclosed directly to the product in question by the factory.

Contents

Introduction **5**
Purpose and target group 5
Reference documents 5
Terms and symbols used 5
Any questions or suggestions? 5
1 Safety provisions **6**
2 Technical data **7**
2.1 Nameplate 7
2.2 Ratings of the GMA series 8
2.3 Technical data for electrical control and operating devices 8
2.4 Utilization in line with the intended purpose 9
2.5 Applied standards 10
2.6 Environmental and operating conditions 11
2.7 Disposal after the end of the service life 11
3 Variants overview **12**
3.1 Circuit-breaker panel GMA 12
3.2 Basic switchgear panels 13
4 Insulating gas monitoring **14**
4.1 Gas compartment diagram 14
4.2 Technical data 15
4.3 Pressure gauges 15
4.4 Measures to be taken at the various warning thresholds 16
5 Voltage Detecting Systems VDS **17**
5.1 Integrated Voltage Detecting System IVIS 17
5.2 Pluggable voltage detection system 17
5.3 Phase comparators 17
6 Operation **18**
6.1 Operator interfaces for manual operation 18
6.2 Interlocks 20
6.2.1 Internal mechanical interlocks of the panel 20
6.2.2 Mechanical lock-out with cylinder lock (optional, see also Fig. 16 to Fig. 18) 20
6.2.3 Mechanical interlock with padlocks (optional) 20
6.2.4 Electromagnetic interlocks 21
6.2.5 Table of mechanical interlocks 22
6.3 Operating specifications 22
6.4 Operation – Circuit-breaker 23
6.4.1 Charging the circuit-breaker's energy storing device 23
6.4.2 Switching operations on the circuit-breaker 24
6.4.3 Position indicators on circuit-breaker and possible operating sequences 24
6.5 Operation - Switch disconnector panel 26
6.6 Operation - switch disconnector panel with fuses 28
6.7 Standard switching operations in circuit-breaker panels 30
6.7.1 Operating the outgoing feeder cable 30
6.7.2 Earthing outgoing feeder cable 31
6.7.3 Connecting busbar sections with bus section coupler 32
6.8 Earthing the busbar 32
6.8.1 Earthing the busbar with earthing device on the cable connection via the circuit-breaker of a feeder panel 32
6.8.2 Earthing the busbar by means of the bus section coupler 33

Contents (contd.)

7 Replacement of fuse links 35
7.1 Selection data for H.V.H.R.C. fuse links 35
7.2 Approved suppliers for H.V.H.R.C. fuse links 35
7.3 Dimensions for fuse links 36
7.4 Use of non-specified fuse links 36
7.5 Replacement of fuses 36
8 Disconnecting the voltage transformer 40
8.1 Disconnecting device for the voltage transformer in the outgoing feeder cable 40
8.2 Disconnecting device for voltage transformer on the busbar 41
9 Maintenance 42
9.1 Safety provisions 42
9.2 Maintenance schedule 42
9.3 Cleaning 43
9.4 Corrosion protection 43
9.5 Replacement of components and panels 43
9.6 Lubrication instructions 44
9.7 Admissible number of breaking perations 45
10 Annex 46
10.1 Auxiliary products 46
10.2 Operation accessories 46

Introduction

This Technical Manual cannot describe every imaginable individual case or every customer-specific version of the product. For information which is not included in this manual, please contact the manufacturer.

As our products are subject to continuous further development, we reserve the right to make changes regarding the standards, illustrations and technical data described in this Technical Manual.

All dimensions specified in this manual are in millimeters.

Purpose and target group

This Technical Manual describes the operation of gas-insulated medium-voltage switchgear units of the GMA series.

It is an integral part of the product and must be stored so that it is readily accessible at all times for and can be used by persons who are to work on the switchgear. If the switchgear is sold to new owners, they must receive this document along with the switchgear.

This Technical Manual is exclusively intended for specialist electricians who have been certified for the GMA series (training certificate).

Reference documents

The following additional documents must be complied with:

- purchase agreement with the stipulations regarding the switchgear-specific equipment and the legal details
- the appropriate switchgear-specific circuit diagrams / documentation
- Assembly Instructions for GMA series (no. AGS 531 526-01)
- the Operating Manuals of the devices installed in the switchgear (e.g. IVIS, devices in low-voltage compartment)
- the Switchgear Configuration “GMA”
- the Technical Manual for the use and handling of the insulating gas sulphur hexafluoride SF_6 (no. AGS 535 051-01)
- Selection lists for H.V.H.R.C. fuses of approved suppliers can be provided on request.

Terms and symbols used

This manual uses certain terms and symbols. They warn about dangers or provide important information which must be complied with in order to avoid danger to persons and damage to equipment:

„Warning“
This danger symbol warns about dangerous electrical voltage. Contact with voltage may result in fatal injury!

„Warning“
This danger symbol warns about the risk of injury. Please comply with all the provisions identified by this symbol in order to avoid death or serious injury.

„Important“
This instruction symbol is used for information which is important to avoid material damage.

Any questions or suggestions?

Do you have any questions or suggestions regarding this manual, or do you require further information?

We always strive to provide you with the best-possible information for optimum, safe use of our products. Thus, do not hesitate to contact us if you have any recommendations, amendments or proposals for improvement.

1 Safety provisions

The work described in this manual may only be performed by specialist electricians
who have proved their experience with the GMA series (training certificate) and the applicable safety provisions.

Applicable standards and regulations:

- Common regulations for high-voltage switchgear and control gear: IEC 62271-1
- Use and handling of sulphur hexafluoride (SF_6) in high-voltage switchgear: IEC 62271-303
- The locally applicable accident prevention, operating and work instructions must be complied with.
- Installation: IEC 61936-1/HD 637 S1[1]
- Operation of electrical equipment: EN 50110-1[1]

[1] The national standards applicable in the country where the equipment is to be installed must be complied with.

Before performing work on the panel, it is essential that you comply with the following instructions:

Warning:
Before starting work on high-voltage components, de-energize the system, verify it for zero voltage and earth the system in accordance with the applicable safety rules pursuant to EN 50110-1.

Warning:
After removal of covers, operator safety in accordance with IEC 62271-200 may be restricted if the appropriate part of the switchgear unit has not been isolated from the power supply.

Warning:
Before performing work in the drive area of the switchgear panels, switch off the supply voltage and prevent it from being switched ON again.

Warning:
There is a risk of injury when working on the drive mechanism. Before commencing work, release the energy-storing device by

- the OFF-ON-OFF (Open/Close/Open) operating sequence on the circuit-breaker
- closing via the make-proof earthing switch.

Behaviour in case of incidents or accidents

For the case of an internal fault, the GMA switchgear features pressure relief ports which prevent the panels and the switchgear unit from bursting.

In case of fire or of internal faults, toxic and caustic decomposition products may be produced. Comply with the locally applicable accident and safety provisions.

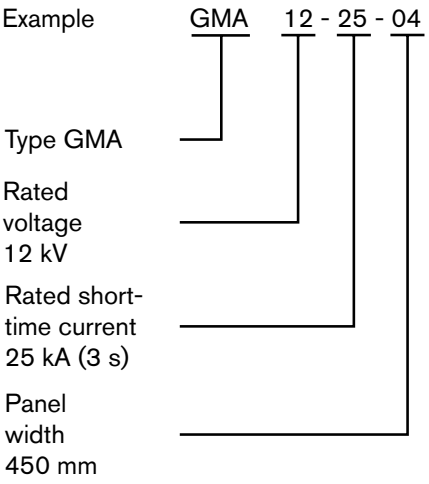
In case of personal injury, take first-aid measures or cause them to be taken.

2 Technical data

2.1 Nameplate

The type designation of the switchgear panels - refer to nameplate - specifies the essential technical data. The following example shows its composition:
In case of queries and orders for spare parts, the following data on the nameplate must be specified:

- Type designation
- Serial number
- Year of construction



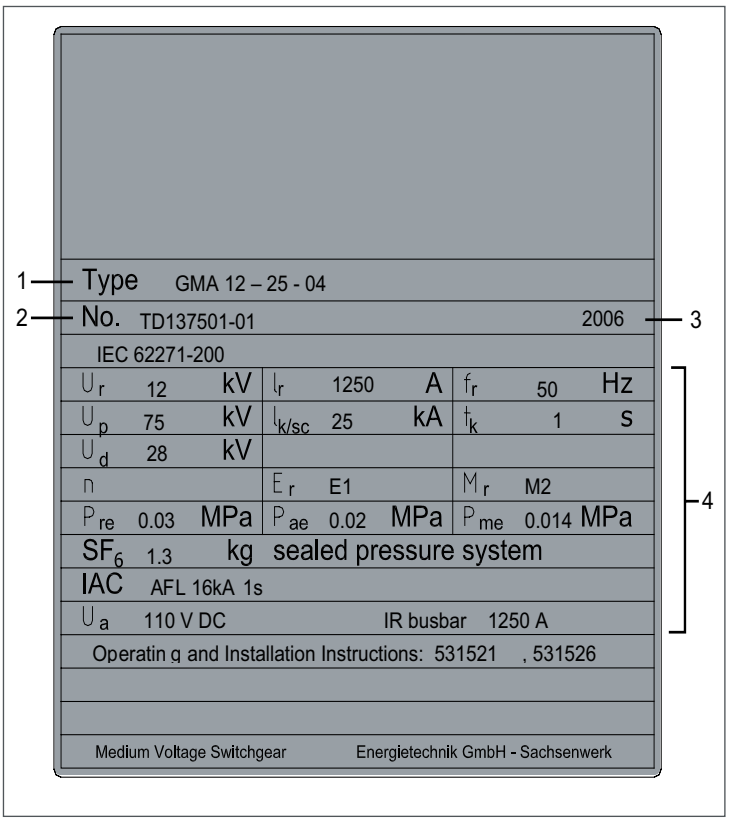


Fig 1.
Nameplate on the operating cover (front side) of the switchgear panel

1 Type designation
2 Serial number
3 Year of construction
4 Technical data

2 Technical data (contd.)

2.2 Ratings of the GMA series

Rated voltage U_r	kV	12	17,5	24
Rated lightning impulse withstand voltage U_p	kV	75	95	125
Rated power frequency withstand voltage U_d	kV	28	38	50
Rated normal current, busbar I_r max.	A	1250		
Rated normal current, outgoing feeder panel I_r max.	A	1250		
Rated peak withstand current I_p max.	kA	63		
Rated short-circuit breaking current I_{sc} max.	kA	25		
Rated short-time current I_k max.	kA	25 (3 s)		
Rated frequency f_r	Hz	50		

2.3 Technical data for electrical control and operating devices

The panels have been designed on principle for manual operation.

The drive mechanisms of the individual switching devices can be equipped, depending on the specific customer's model, with additional electrical control and operating devices. These are characterized in the switchgear-specific circuit diagram (see switchgear documentation).
Component fitting options:

Motor

- for charging the energy-storing device (closing spring)
- actuation of the disconnector and earthing switc

Release

- Closing release (1 ea.)
- Opening release (max. 2 ea.)
- Secondary release (transformer-operated release) (max. 1 ea.)
- Undervoltage release (1 ea.)

The maximum number of components fitted (shunt opening, secondary and undervoltage release) is 2 ea. per panel.

Blocking coil

Blocking coils prevent the circuit breaker from being closed and opened via the pushbuttons "ON" or "OFF", as well as actuation of the interrogating slides of the disconnectors and earthing switches. In deenergized condition, blocking coils are always in "blocked" condition.

Auxiliary switch

Auxiliary switches are always actuated directly by the switch shaft via an intermediate linkage. Their position always corresponds to that of the main contacts
The switching functions have been set in the factory according to the circuit diagram.

Rated supply voltage	V	DC					AC	
		24	48	60	110	220	120	230
Switching capacity	A	8	4	3	2	1	10	10
Time factor T=L/R	ms	≤ 20						
Rated short-time current		100 A for a duration of 30 ms						
Rated continuous current	A	10						

Overview of rated supply voltages		
Direct voltage DC	**V**	24 / 48 / 60 / 110 / 125 / 220
Alternating voltage AC	**V**	120 / 230

Power consumption, solenoids and motor

	Power consumption	
	DC approx. [W]	**AC 50/60 Hz approx. [VA]**
Closing release	160	160
Opening release without auxiliary spring energy store	160	160
Opening release with auxiliary spring energy store	25	25
Undervoltage release	15	15
Secondary release	-	12
Blocking coil	12	12
Motor	200 - 250	200 - 250

Please enquire at the manufacturer's for details of the motor's starting current.
The supply voltage data is required to this effect.

Times for releases and motor		
Minimum command time "OFF" for release 160 W for release 25 W	 **ms** **ms**	 20 50
Minimum command time "ON"	**ms**	20
Motor charging time for energy storing device	**s**	≤ 12

2.4 Utilization in line with the intended purpose

Gas-insulated GMA medium-voltage switchgear units are exclusively intended for switching and distributing electrical energy. They may only be used in the scope of the specified standards and the switchgear-specific technical data. Any other utilization constitutes improper use and may result in dangers and damage.

Disclaimer of liability

The manufacturer shall not be held responsible for damage which occurs if

- instructions in this Technical Manual are not complied with,
- the switchgear is not operated according to its intended use (see above),
- the switchgear is assembled, connected or operated improperly,
- accessories or spare parts are used which have not been approved by the manufacturer,
- the switchgear is converted without the manufacturer's approval, or if inadmissible parts are attached.

No liability is accepted for parts provided by customers, e.g. current transformers.

2.5 Applied standards

GMA switchgear units are

- metal-enclosed
- SF_6-insulated
- type-tested
- tested for internal faults
- dimensioned for indoor installation

GMA switchgear units meet the following standards and regulations

Designation	IEC standard	EN standard
Switchgear	IEC 62271-1 IEC 62271-200	EN 62271-200
Internal arc classification (IAC)	IEC 62271-200	EN 62271-200
Circuit-breaker	IEC 62271-100	EN 62271-100
Earthing switch	IEC 62271-102	EN 62271-102
Disconnector	IEC 62271-102	EN 62271-102
Switch disconnector	IEC 60265-1	EN 60265-1
Switch fuse disconnector combination	IEC 62271-105	EN 62271-105
Current transformers	IEC 60044-1	EN 60044-1
Voltage transformers	IEC 60044-2	EN 60044-2
Voltage Detecting Systems	IEC 61243-5	EN 61243-5
Protection against acci¬dental contact, foreign bodies and water	IEC 60529	EN 60529
Installation	IEC 61936-1	HD 637 S1
Operation of electrical equipment	-	EN 50110
Insulating gas sulphur hexafluoride (SF_6)	IEC 60376	EN 60376
Use and handling of sulphur hexafluoride (SF_6)	IEC 62271-303	–

Degrees of protection against accidental contact and foreign objects (according to IEC 60529)	
Main electric circuits	IP 65
Drives	IP 2X[1]
Low-voltage compartment	IP 3X[2]
Cable compartment	IP 3X

[1] optional IP 5X
[2] optional IP 52

2.6 Environmental and operating conditions

GMA is an indoor switchgear which may only be operated under normal operating conditions in acc. with IEC 62271-1 regulations.

Operation under conditions deviating from these is only admissible upon consultation and with the approval of the manufacturer.

Ambient conditions (in accordance with IEC 62271-1)		
Temperature class		“minus 5 indoors”[1]
Ambient temperature min./max	°C	-5 / 40[1]
Average value over 24 hours	°C	≤ 35[1]
Average rel. air humidity: 24 hours / 1 month	%	≤ 95/≤ 90[1]
Installation altitude above sea-level	m	≤ 1000[1]

[1] higher values available on request

2.7 Disposal after the end of the service life

A material and recycling data sheet can be provided on request for the disposal of series GMA switchgear at the end of its service life:

Disposal is performed as a service by the manufacturer’s Service Center which is subject to a fee.

The operating equipment contains the fluorinated greenhouse gas SF_6 mentioned in the Kyoto protocol with a global warming potential (GWP) of 22 200.

SF_6 must be recovered and must not be released into the atmosphere. When using and handling SF_6, comply with the specifications in the standard IEC 62271 High-Voltage Switchgear and Controlgear – Part 303 Use and Handling of Sulphur Hexafluoride (SF_6).

3 Variants overview

3.1 Circuit-breaker panel GMA

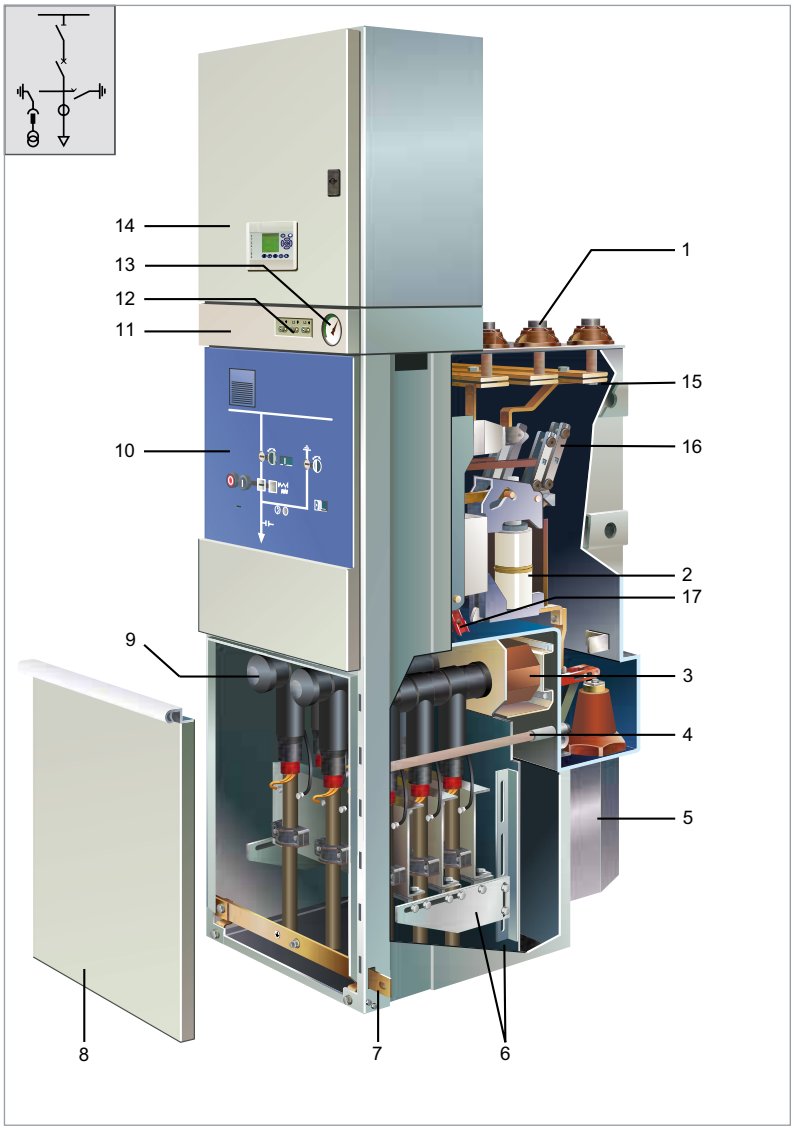


Fig. 2
Circuit-breaker panel with current and voltage transformers, panel width 600 mm

1 Busbar connectors (in the coupling tank / end tank), shown: right-hand side; left-hand side analogous
2 Circuit-breaker
3 Toroidal-core current transformer
4 Disconnecting device for voltage transformer (optional)
5 Voltage transformer (optional)
6 Adjustable cable supports
7 Earthing link bar
8 Cable compartment cover
9 Cable connection three-fold combination
10 Manual operator interface
11 Instrument niche
12 Voltage detection systems
13 Pressure gauge (temperature-compensated)
14 Low-voltage compartment with control device
15 Busbar
16 Disconnector
17 Earthing switch

3.2 Basic switchgear panels

Fig.3
Switchgear panel with circuit-breaker

Fig. 4
Switchgear panel with circuit-breaker, voltage transformer, double cable connection

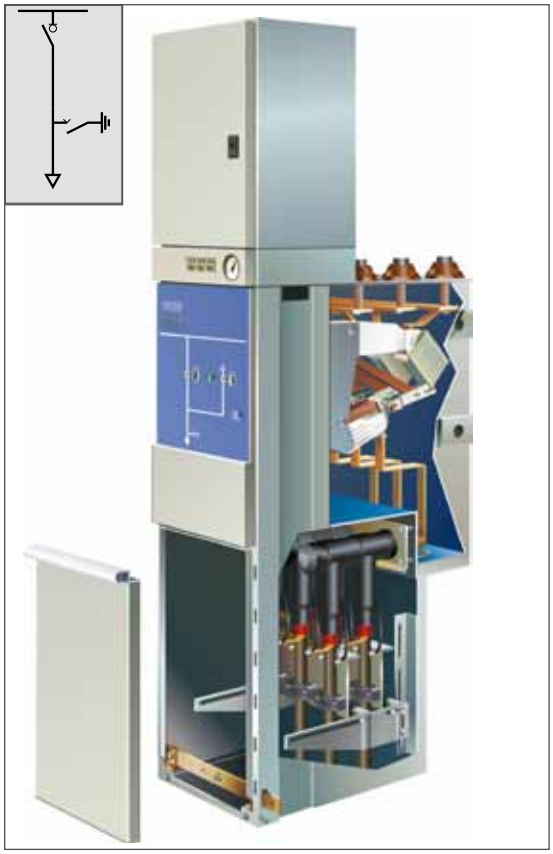


Fig.5
Switchgear panel with switch disconnector

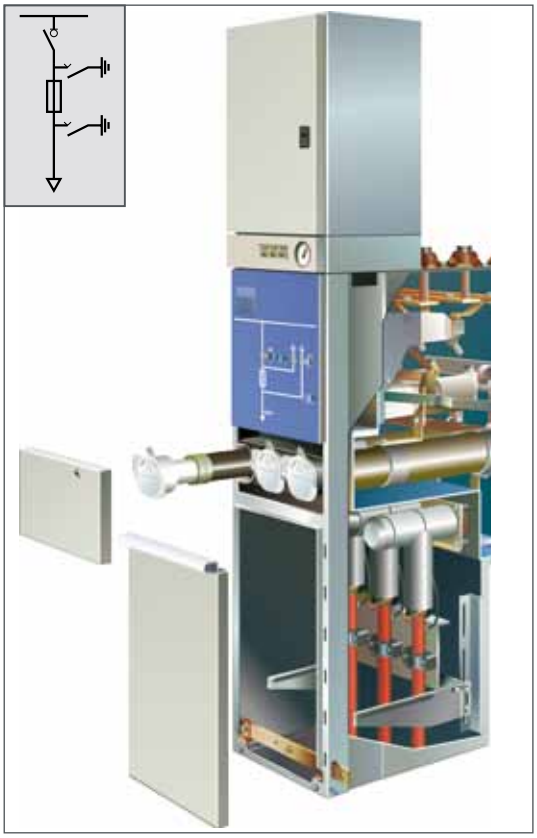


Fig. 6
Switchgear panel with switch fuse combination

4 Insulating gas monitoring

4.1 Gas compartment diagram

A complete insulating gas compartment always consists of the following functional units:

- Module comprising 1 to 4 panels
- if applicable, one busbar connection tank, located at the right end of each module
- if applicable, busbar termination compartment (left-hand or right-hand)

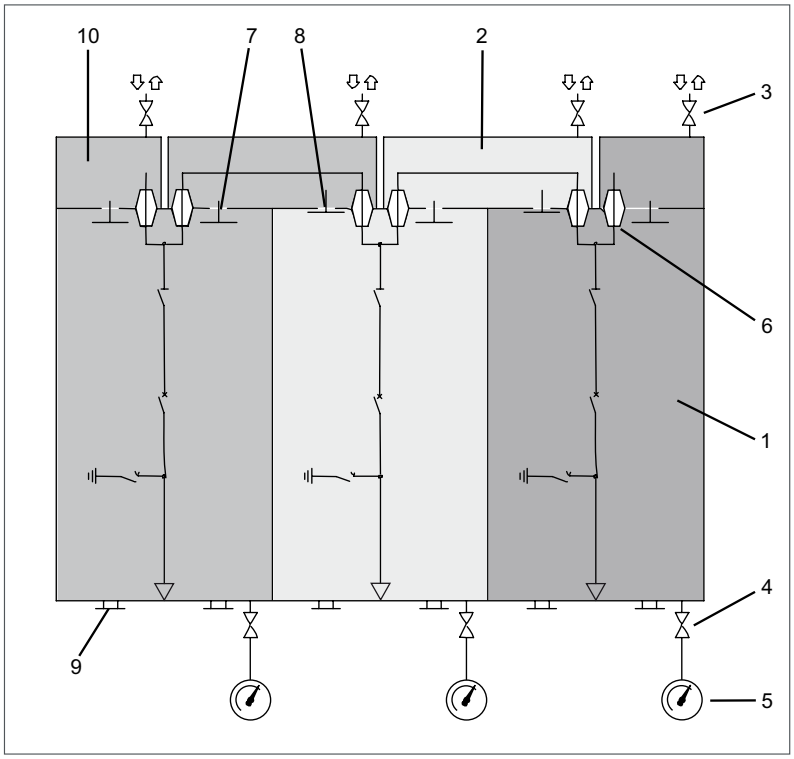


Fig. 7
3 single panels, showing all function and control elements regarding the gas compartment as an example These have been shown in graded grey shades to reflect the various insulating gas compartments.

1 Switchgear panel
2 Busbar coupling tank
3 Gas connector socket
4 Check valve
5 Pressure gauge
6 Gas-proof electrical bushing
7 Vave open (code 2)
8 Vave closed (code 0)
9 Pressure relief port
10 Busbar end tank

4 Insulating gas monitoring

(contd.)

4.2 Technical data

Type of insulating gas: Sulphur hexafluoride SF_6 according to IEC 60376.

The tanks of the switchgear have been designed as “Sealed Pressure System“ as defined in IEC 62271-200. Thanks to the design of the “Sealed Pressure System”, the insulating gas contents do not require any maintenance.

During the expected service life, no gas handling will be required under normal operating conditions acc. to IEC 62271-1.

Important:
The switchgear-specific gas compartment diagram must be complied with

Rated pressure and pick-up values[1] (Rated voltage U_r = 12/24 kV)		
Rated pressure p_{re}	**MPa**	0,03
Prealarm in case of drop in pressure p_{ae}	**MPa**	0,02
Main alarm in case of drop in pressure	**MPa**	0,01

[1] The pressure data refers to +20°C and an atmospheric pressure of 101.3 kPa abs.

4.3 Pressure gauges

The pressure gauge indication is ambient temperature-compensated. The pressure indication remains constant if the operating mode remains unchanged, even if the temperature in the switchgear room changes.

Variants

- Pressure gauge without remote signalling contacts (Fig. 8)
- Pressure gauge with remote signalling contacts (Fig. 9)

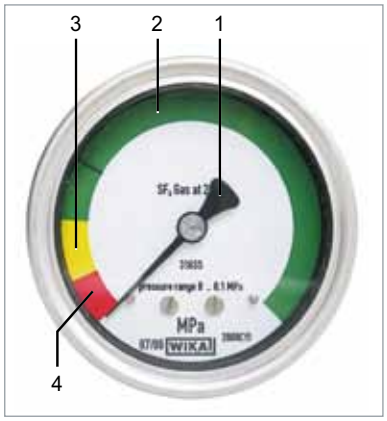


Fig. 8
Pressure gauge without remote signalling contacts
1 Pointer
2 Pointer in the green area (Ready for operation)
3 Pointer in the yellow area (Prealarm)
4 Pointer in the red area (Main alarm)

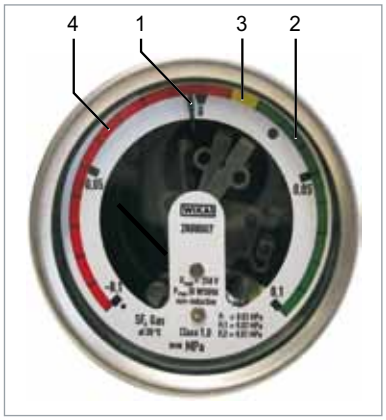


Fig. 9
Pressure gauge without remote signalling contacts
1 Pointer
2 Pointer in the green area (Ready for operation)
3 Pointer in the yellow area (Prealarm)
4 Pointer in the red area (Main alarm)

Electrical signalling contact	Switching function: closes in case of a drop in pressure, if
1	... prealarm is reached
2	... main alarm is reached

4 Insulating gas monitoring

(contd.)

4.4 Measures to be taken at the various warning thresholds

Warning!
If a main warning occurs, switch disconnectors must no longer be actuated. As the switch disconnector requires a minimum gas density for correct functioning, actuation might result in damage to equipment and injury of persons.

Pressure gauge display	Activities
Prealarm “yellow”	■ Top up insulating gas and observe the system to see if the prealarm reoccurs ■ Plan ahead for shut-off ■ Contact Service-Center
Main alarm “red”	■ Isolate module/single panel from power supply ■ Do not actuate switch disconnector any longer ■ ContactService-Center

5 Voltage Detecting Systems VDS

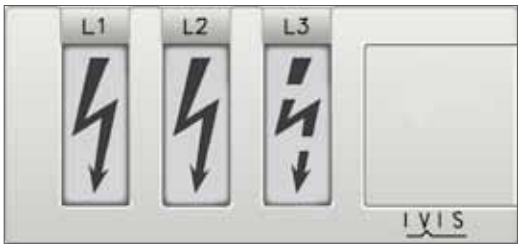


Fig. 10
IVIS display. The IVIS display is located in the instrument recess below the lowvoltage compartment.

5.1 Integrated Voltage Detecting System IVIS

IVIS is an integrated voltage detecting system with an integrated display unit used to determine zero voltage/ system voltage according to IEC 61243-5.
The IVIS system has been designed for maximum operating reliability.
It does not require supply from an external source. It features climateproof encapsulated lectronics and is maintenance-free, due to permanent monitoring of the indication thresholds.
Flash arrow symbols on the indicators display the mains voltage still existing within the defined response thresholds (Fig. 10).
The IVIS system does not require the electrical repeat tests common for voltage detection systems.

Important:
For a description of all functions and messages of the IVIS system, please refer to the separate Operating Manual “IVIS” (No. AGS 531 757-01).

Fig. 11
Voltage indicator unit (HR-ST)
Manufacturer: Horstmann GmbH

Fig. 12
Socket-contacts for HR system

5.2 Pluggable voltage detection system

The system voltage or the zero voltage state of the outgoing feeders is detected via a separate voltage detection system according to IEC 61243-5.

Socket-contacts for the indicators are located in the instrument-recess below the low-voltage compartment.

Capacitive voltage presence indicating systems of all the approved manufacturers can be used.

Important:
Comply with the manufacturer’s Operating Manual of the voltage indicators used.

All three phases L1, L2 and L3 must always be checked together.

Close non-used socket-contacts using a cap.

5.3 Phase comparators

Important:
Before connecting live switchgear components for the first time, always check phase coincidence.

If IVIS is used, phase comparison can be performed by means of the phase comparator MS 100 (Fig. 13, ref. no. AGS C26320-01).
Phase comparators are optionally available and not included in the scope of supplies.

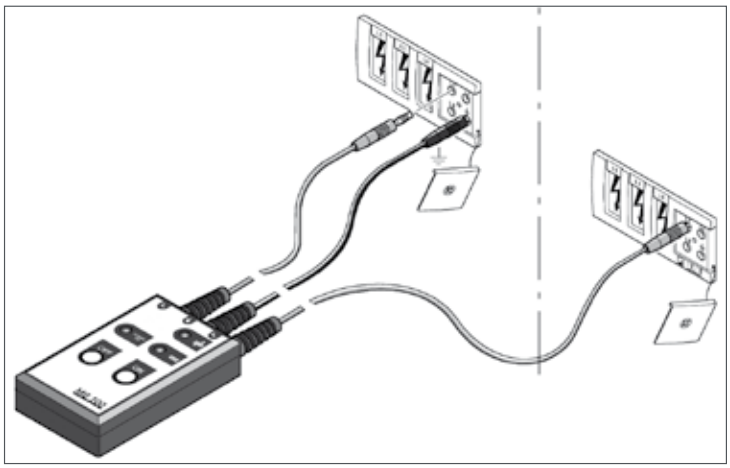


Fig. 13
Phase comparator MS 100

6.1 Operator interfaces for manual operation

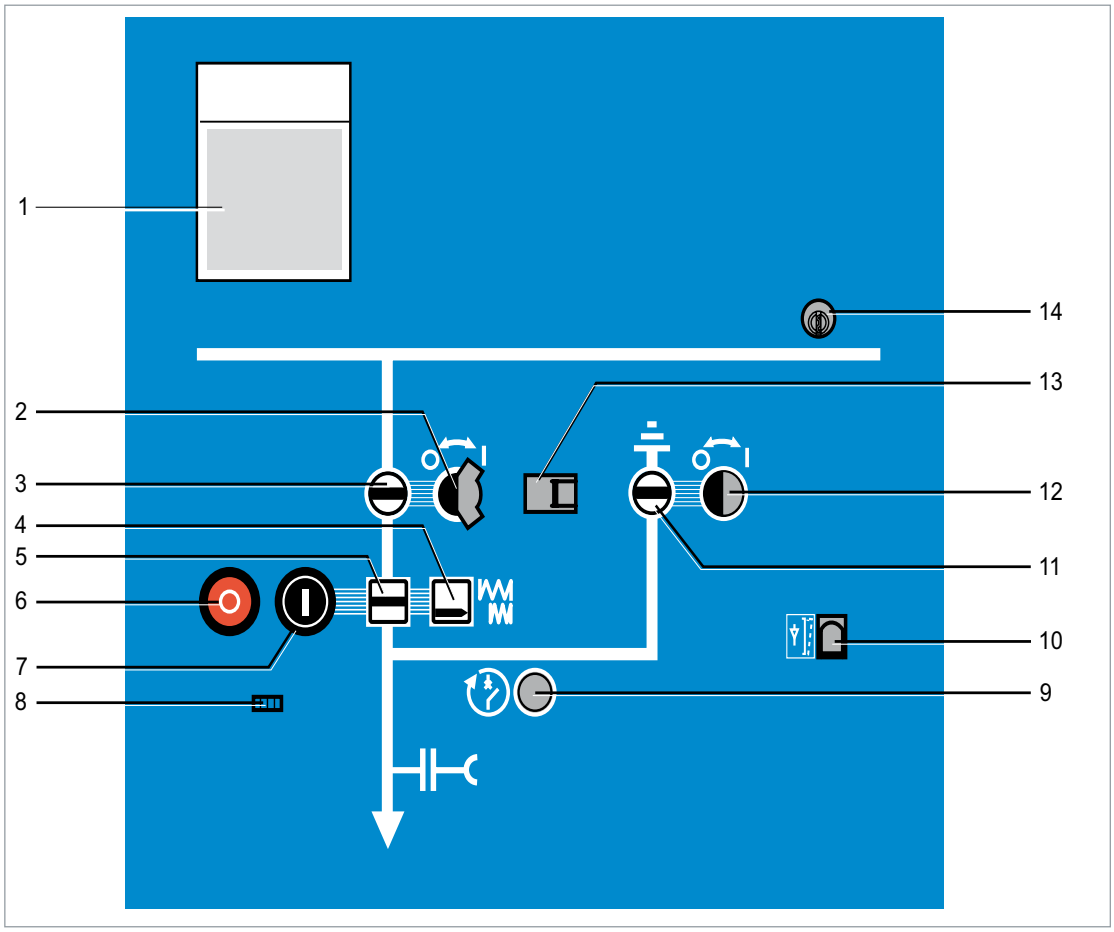


Fig. 14
Operator interface “Circuit-breaker”
1 Nameplate
2 Opening for operation of the disconnector
3 Position indicator of disconnector
4 Circuit-breaker position indicator DISCHARGED / CHARGED
5 Circuit-breaker switch position indicator
6 Circuit-breaker OFF pushbutton
7 Circuit-breaker ON pushbutton
8 Circuit-breaker operations counter
9 Insertion port for mechanical charging of the circuit-breaker’s energy storing device
10 Unlocking slide for cable compartment cover
11 Position indicator of earthing switch
12 Insertion port for operation of the earthing switch
13 Mechanical interrogation interlock of insertion ports (interrogation slide)
14 Mechanical lockout mechanism with lock (optional)

6 Operation (contd.)

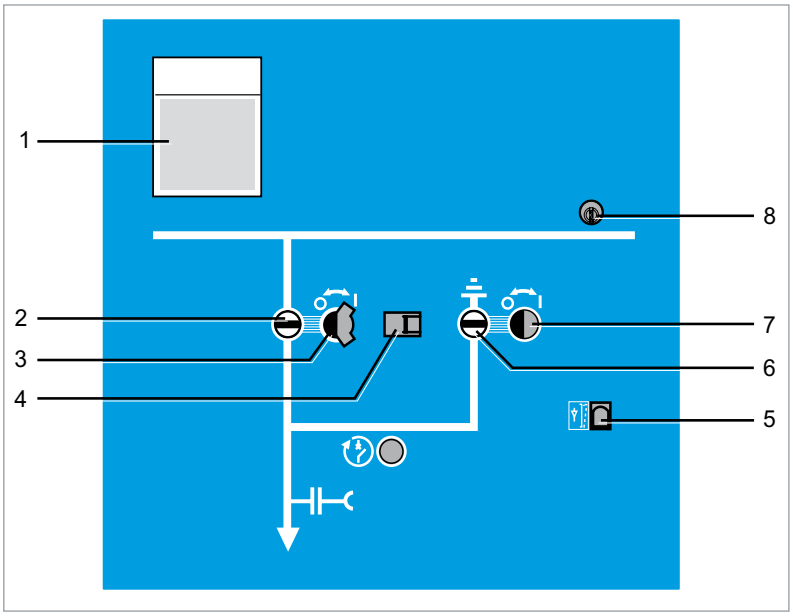


Fig. 15
Operator interface “Switch disconnector”
1 Nameplate
2 Position indicator of switch disconnector
3 Opening for operation of the switch disconnector
4 Mechanical interrogation interlock of insertion ports (interrogation slide)
5 Unlocking slide for cable compartment cover
6 Position indicator of earthing switch
7 Insertion port for operation of the earthing switch
8 Mechanical lockout mechanism with lock (optional)

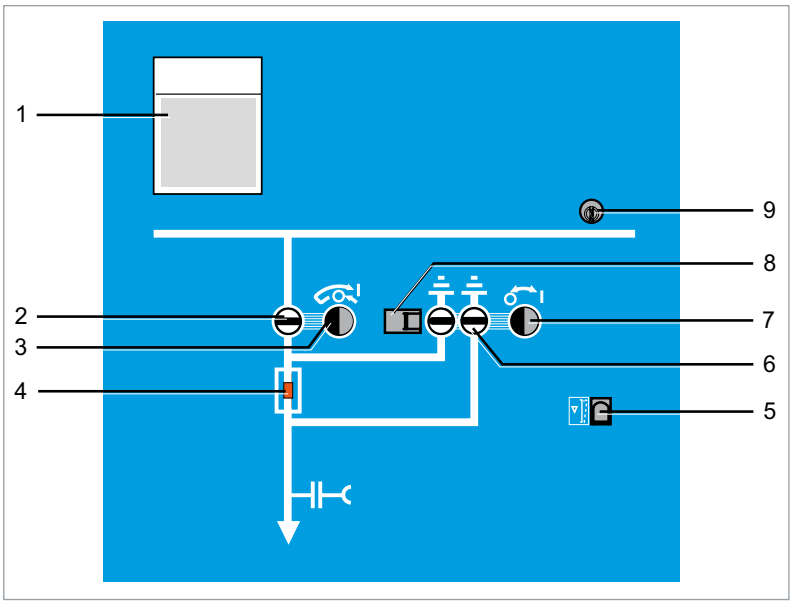


Fig. 16
Operator interface “Switch disconnec¬tor with fuse”
1 Nameplate
2 Position indicator of disconnector
3 Opening for operation of the disconnector
4 Indication of fuse tripping (H.V.H.R.C. fuses) green: no fuse tripped red H.V.H.R.C. fuse tripped
5 Unlocking slide for cable compartment cover
6 Position indicator of earthing switch
7 Insertion port for operation of the earthing switch
8 Mechanical interrogation interlock of insertion ports (interrogation slide)
9 Mechanical lockout mechanism with lock (optional)

6.2 Interlocks

Warning!
Complete switchgear interlocking can only be ensured with complete locking devices.

Important!
Please note the purchase contract and the switchgear-specific circuit diagram as regards the design of the interlocking systematics.

6.2.1 Internal mechanical interlocks of the panel

- With the circuit-breaker closed, the interrogation slide is locked for the disconnector and the earthing switch.
- The interrogation slide always releases one insertion port (disconnector or earthing switch), or both of them are locked.
- The lever for the disconnector can only be removed in its end position.
- When the lever for actuation of the disconnector or earthing switch has not been removed, or if the interrogation slide is open, the following components are locked:
  - ON pushbutton of the circuit-breaker cannot be pressed
  - ON pulse is interrupted.

6.2.2 Mechanical lock-out with cylinder lock (optional, see also Fig. 16 to Fig. 18)

* In the case of branch-circuit panels, the circuit-breaker button “OFF” can be actuated.

If the lever for actuation of the disconnector or earthing switch has not been removed, the key of the mechanical lock-out can neither be turned nor removed.

Turn key	Key	Actuations on front control panel
clockwise	removable	actuation not possible *
counter-clockwise	not removable	actuation possible

6.2.3 Mechanical interlock with padlocks (optional)

On request, circuit breakers, disconnectors and earthing switches can be equipped with padlocks to prevent mechanical actuation

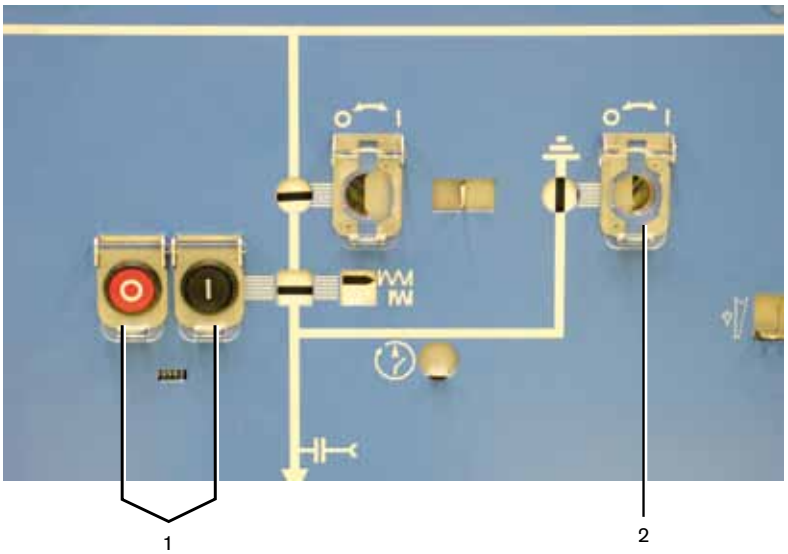


Fig. 17
1 Interlock flaps for ON/OFF pushbutton
2 Insertion port for earthing switch blocked (disconnector analogous)

6.2.4 Electromagnetic interlocks

Electromagnetic blocking coils can be used for inter-panel as well as intrapanel interlocks:

- The insertion openings for disconnector and earthing switch by the interrogation slide are prevented from being released.
- The circuit-breaker's ON and OFF pushbuttons are blocked.

Important:

- If no blocking coils are being used for the locking devices, a mechanical lock-out with cylinder or U lock must be provided.
- In case of failure of the supply voltage, all electrical interlocks are in their "locked" position. Measure: Re-establish supply voltage.

Blocking coil required, if ...	Interlock function
... motor drive on disconnector	ON pushbutton of circuit-breaker
... bus section coupler in switchgear	Bus section coupler: ■ ON / OFF pushbutton of circuit-breaker ■ Interrogation slide for earthing switch in circuit-breaker panel ■ Interrogation slide for disconnector and earthing switch in bus riser panel all disconnectors in the outgoing feeder panels or additional couplers

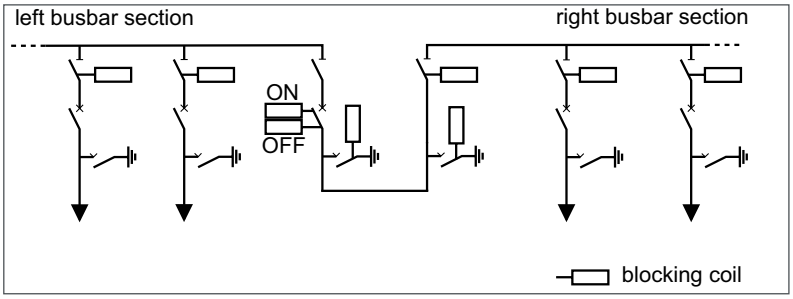


Fig. 18
Blocking coil interlocks in GMA switchgear with bus section coupler

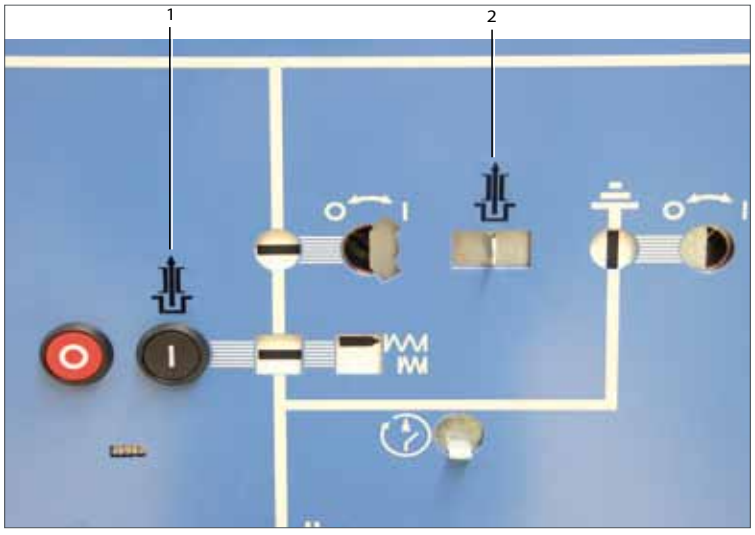


Fig. 19
Blocking coils in a circuit-breaker panel
1 Blocking coil on ON pushbutton of circuit-breaker
2 Blocking coil on interrogation slide

6.2.5 Table of mechanical interlocks

Switchgear panel with circuit-breaker, disconnector and earthing switch

Switching device/ component	State	Interlock state versus …			
		Circuit-breaker	Disconnector	Earthing switch	Cable compartment cover
Circuit-breaker	ON	–	locked	unlocked, if disconnector OFF	unlocked, if earthing switch ON
				locked, if disconnector ON	locked, if earthing switch OFF
	OFF	–	locked, if earthing switch ON	unlocked, if disconnector OFF	unlocked, if earthing switch ON
			unlocked, if earthing switch OFF	unlocked, if disconnector ON	locked, if earthing switch OFF
Disconnector	ON	unlocked	–	locked	locked, if earthing switch OFF
	OFF	unlocked	–	unlocked	locked, if earthing switch OFF
Earthing switch	ON	unlocked	locked	–	unlocked
	OFF	unlocked	unlocked	–	locked
Cable compartment cover	removed	unlocked	locked		–
	attached	–	–	unlocked, if disconnector OFF	–

Switchgear panel with switch disconnector, earthing switch and disconnector with fuse, earthing switch

Switching device/ component	State	Interlock state versus …		
		Switch disconnector	Earthing switch	Cable compartment or fuse cover
Switch disconnector	ON	–	locked	locked if earthing switch OFF
	OFF	–	unlocked	locked if earthing switch OFF
Earthing switch	ON	locked	–	unlocked
	OFF	unlocked	–	locked
Cable compartment or fuse cover	removed	locked	locked	–
	attached	unlocked if switch disconnector OFF	unlocked if switch disconnector OFF	–

6.3 Operating specifications

- The switchgear unit may only be operated by specialist electricians who have proven experience in conjunction with the GMA series (training certificate) and the EN 50110-1 standard.
- Check that the supply voltage is ON.
- The switchgear can also be actuated manually using the actuating lever/ crank.

Important:

These accessories are supplied together with the panel. The panel may only be operated by means of these accessories (see page 43).

- After each switching operation for which you have used an actuating lever/a crank, remove the actuating lever and store it in the tool board.

Warning!
The ON - OFF movements need to be fully completed (to their stop). Never let off detachable lever before the switching operation has been completed. Risk of injury as the lever might rebound if it is not actuated to its mechanical stop.

Important:

- While the supply voltage is not available, an undervoltage release (optional) has dropped out.
- Comply with interlocking conditions in Chapter .

6.4 Operation – Circuit-breaker

6.4.1 Charging the circuit-breaker's energy storing device

Initial position:

- Circuit-breaker "OFF"
- Energy storing device "released" storing device

Charging by means of a motor

The energy storing device is charged automatically, as soon as the supply voltage is available.
The position indicator of the energy storing device indicates the "charged" condition.

Manual charging

- Insert crank.
- Move crank clockwise until "charged" is indicated by the position indicator. If the motor starts during this process, this does not constitute a risk.
- Remove crank and keep it in a safe place.

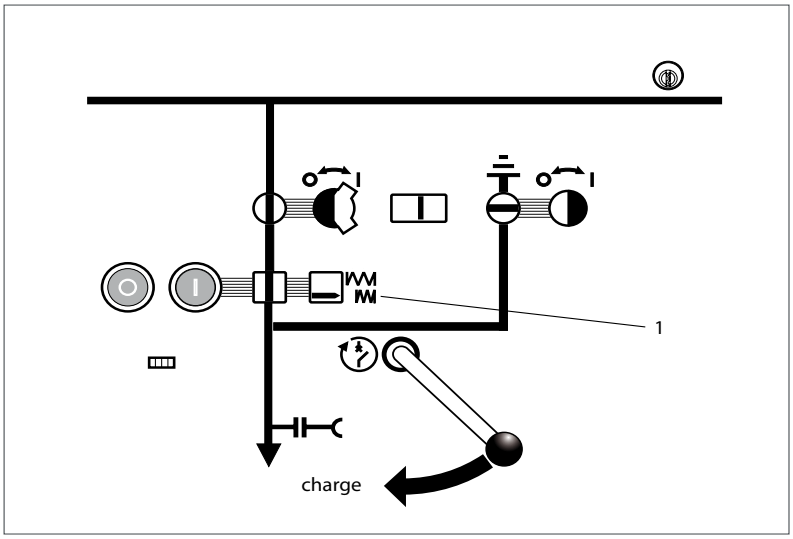


Fig. 20
Charge the circuit-breaker's energy storing device (closing spring) manually
1 Energy storing device charged

6.4.2 Switching operations on the circuit-breaker

Switching ON (Closing)

- Push the ON button
- Actuate closing release.

The energy storing device indicates “released”. The position indicated by the switch position indicator is “ON”.

Important:
The energy storing device can be charged again immediately (manually) after ON actuation. When the supply voltage is on, the energy storing device is charged automatically via the motor.

Switching OFF (Opening)

- Push “OFF“ button or
- Actuate opening release or
- by secondary release or undervoltage release

Position indicator indicates the “OFF” position.

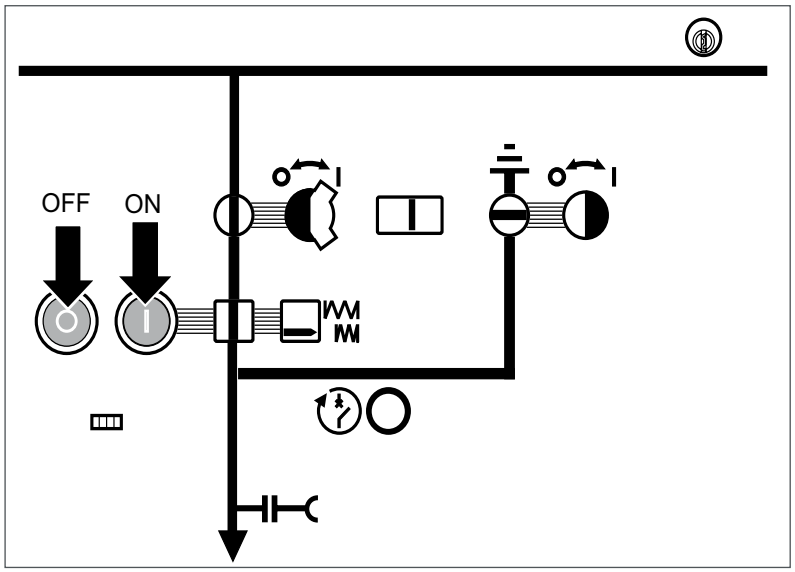


Fig. 21
Circuit-breaker. Switching ON/OFF.

6.4.3 Position indicators on circuit-breaker and possible operating sequences

Pos.	Position indicator Energy-storing device (closing spring)		Position indicator Circuit-breaker		Opening spring	Possible operating sequence
1		released		OFF	released	none
2		charged		OFF	released, is charged via C	C–O
3		released		ON	charged	O
4		charged		ON	charged, is re-charged via C	O–C–O

C = ON (Close) O = OFF (Open)

Switching operations on the disconnector

Important:
Motor drive on disconnector (optional): During actuation of the interrogation slide or while the actuating lever is inserted, the motor circuit is interrupted. For emergency manual actuation moving the detachable lever into ON position, first a short pressure must be exercised in OFF position (to overcome the dead center in the drive linkage), and vice versa.

Initial situation:

- Circuit-breaker OFF
- Disconnector OFF
- Earthing switch OFF

Switching ON manually:

- Actuate interrogating lever to the right to release the appropriate insertion port.
- Insert actuating lever and move it clockwise
- Remove crank

Switching OFF manually:

- Push interrogating lever to the right to release the appropriate insertion port
- Insert actuating lever and move it counter-clockwise.
- Remove crank

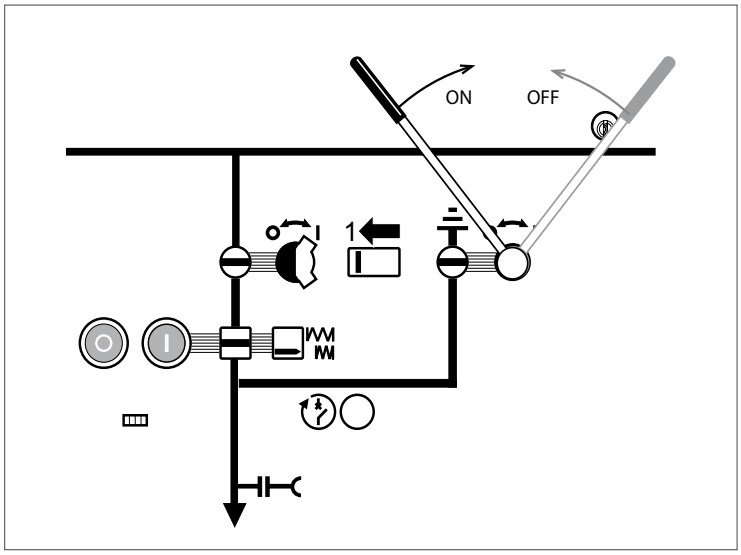


Fig. 22
Disconnector. Switching ON/OFF.

Switching operations on the earthing switch

Important:
Motor drive on earthing switch (optional): During actuation of the interrogation slide or while the actuating lever is inserted, the motor circuit is interrupted. For emergency manual actuation moving the detachable lever into ON position, first a short pressure must be exercised in OFF position (to overcome the dead center in the drive linkage), and vice versa.

Initial situation:

- Circuit-breaker OFF
- Disconnector OFF
- Earthing switch OFF

Switching ON manually:

- Actuate interrogating lever to the left to release the appropriate insertion port.
- Insert actuating lever and move it clockwise
- Remove actuating lever

Switching OFF manually:

- Actuate interrogating lever to the left to release the appropriate insertion port
- Insert actuating lever and move it counter-clockwise.
- Remove actuating lever.

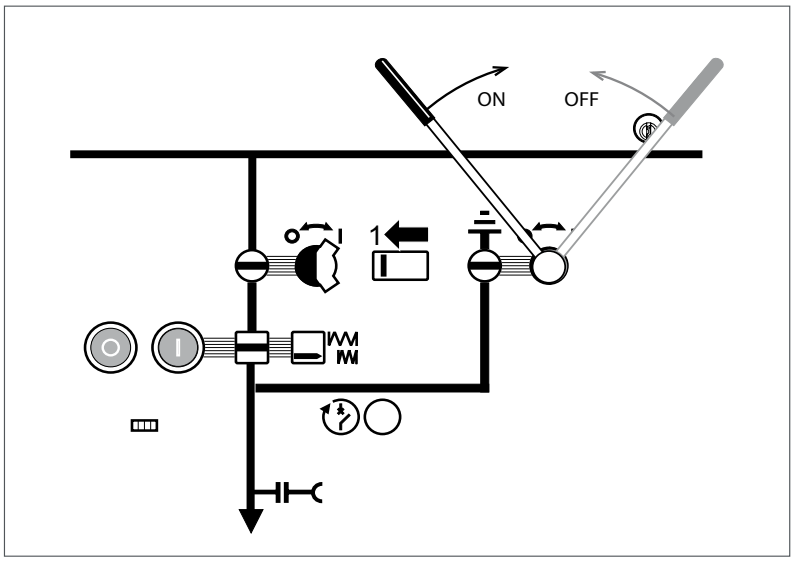


Fig. 23
Earthing switch. Switching ON/OFF.

6.5 Operation - Switch disconnector panel

Switching operations on the switch disconnector

Warning!
If the main alarm of the pressure gauge is issued, the switch disconnector must not be operated.

Important:
Motor drive on switch disconnector (optional): During actuation of the interrogation slide or while the actuating lever is inserted, the motor circuit is interrupted. For emergency manual actuation moving the detachable lever into ON position, first a short pressure must be exercised in OFF position (to overcome the dead center in the drive linkage), and vice versa.

Switching ON manually:

- Actuate interrogating lever to the right to release the appropriate insertion port.
- Insert actuating lever and move it clockwise
- Remove lever.

Switching OFF manually:

- Push interrogating lever to the right to release the appropriate insertion port.
- Insert actuating lever and move it counter-clockwise.
- Remove lever.

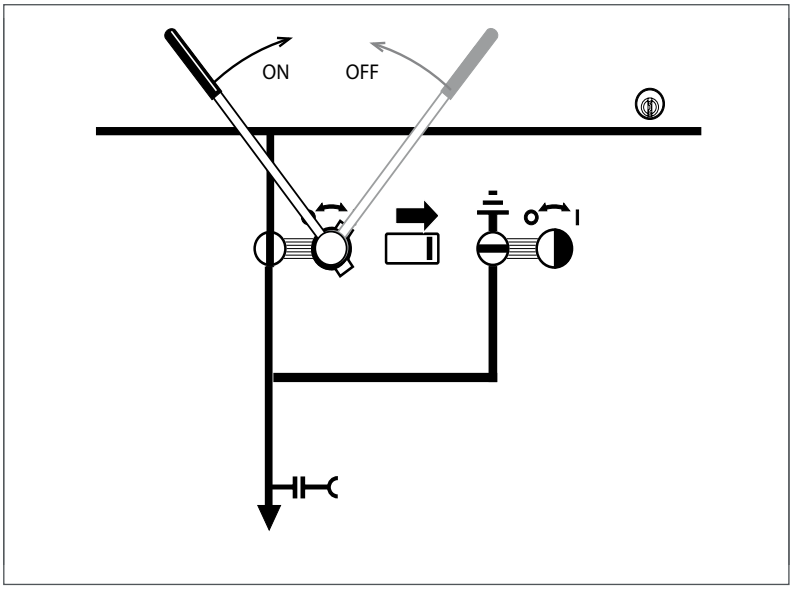


Fig. 24
Switch disconnector. Switching ON/OFF.

Switching operations on the earthing switch

Initial situation:

- Switch disconnector OFF
- Earthing switch OFF

Switching ON manually:

- Actuate interrogating lever to the left to release the appropriate insertion port.
- Insert actuating lever and move it clockwise.
- Remove actuating lever.

Switching OFF manually:

- Actuate interrogating lever to the left to release the appropriate insertion port.
- Insert actuating lever and move it counter-clockwise.
- Remove actuating lever.

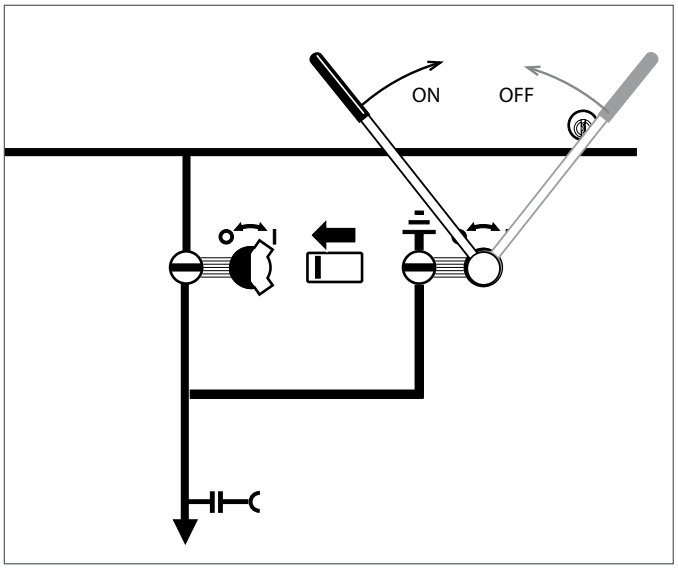


Fig. 25
Earthing switch. Switching ON/OFF

6.6 Operation - switch disconnector panel with fuses

Switching operations on the switch disconnector

Warning!
If the main alarm of the pressure gauge is issued, the switch disconnector must not be operated.

Switching ON manually:

- Actuate interrogating lever to the right to release the appropriate insertion port.
- Actuate detachable lever speedily to the left until the breaker mechanism has latched (approx. 95°) (thus, the opening spring is charged). Subsequently, actuate detachable lever speedily to the right (approx. 115°) until closing is complete (at the same time, the closing spring is charged and set free).
- Remove detachable lever immediately afterwards.

Switching OFF manually:

- Push interrogating lever to the right to release the appropriate insertion port
- Insert detachable lever.
- Actuate detachable lever speedily to the left (approx. 20°) until opening is complete.

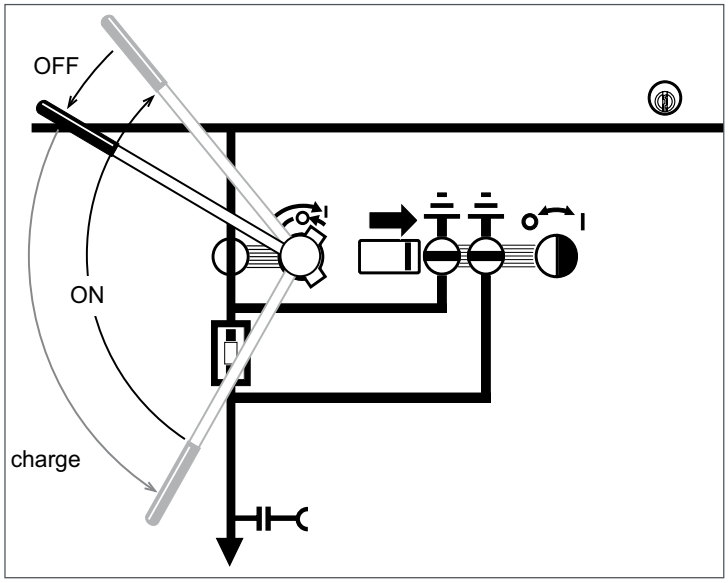


Fig. 26
Switch disconnector. Switching ON/OFF and charging

Switching operations on the earthing switch

Initial situation:

- Switch disconnector OFF
- Earthing switch OFF

Switching ON manually:

- Actuate interrogating lever to the left to release the appropriate insertion port.
- Insert actuating lever (red) and turn it clockwise (approx. 95°).
- Remove actuating lever.

Switching OFF manually:

- Actuate interrogating lever to the left to release the appropriate insertion port
- Insert actuating lever and move it counter-clockwise.
- Remove actuating lever.

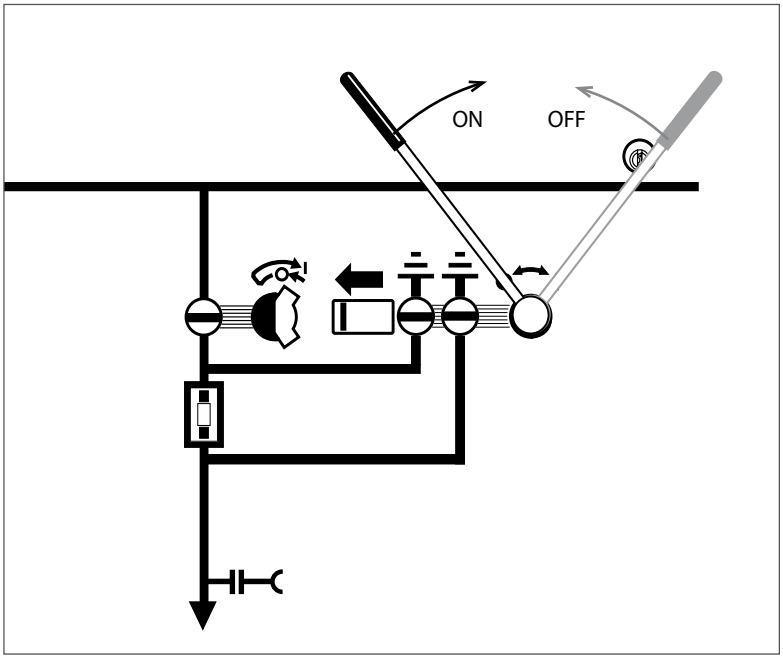


Fig. 27
Earthing switch. Switching ON/OFF.

6.7 Standard switching operations in circuit-breaker panels

Important:
For all switching operations, comply with the interlocking conditions (Chapter) and the operating specifications in Chapter 6.3.

6.7.1 Operating the outgoing feeder cable

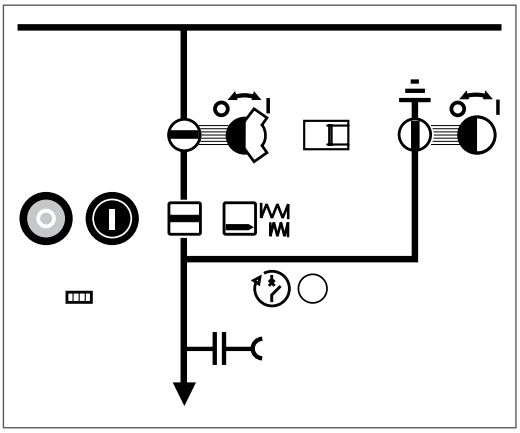
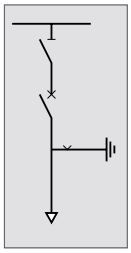


Fig. 28



Initial situation
- Circuit-breaker OFF
- Disconnector OFF
- Earthing switch OFF

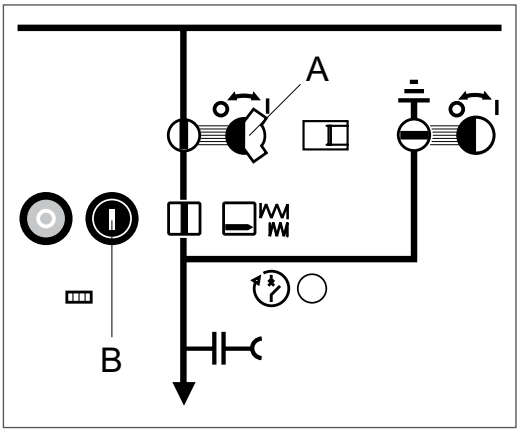
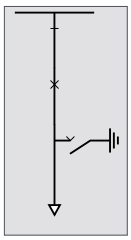


Fig. 29



Switch outgoing feeder cable ON
1 Switch disconnector ON (A).
2 Switch circuit-breaker ON (B).

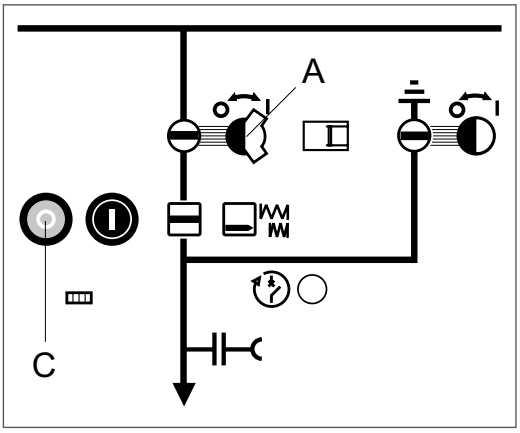
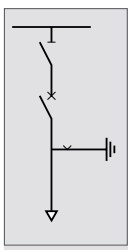
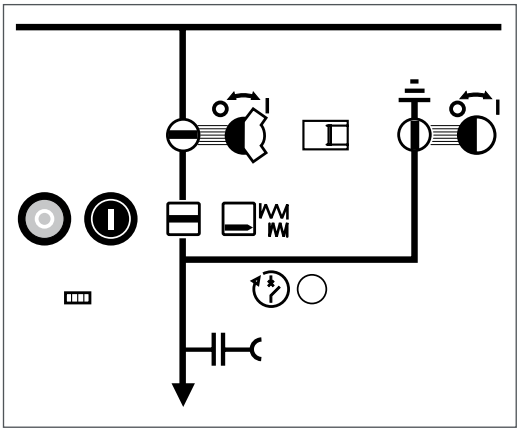


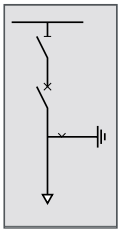
Fig. 30



Switch outgoing feeder cable OFF
1 Switch circuit-breaker OFF (C).
2 Switch disconnector OFF (A).

6.7.2 Earthing outgoing feeder cable

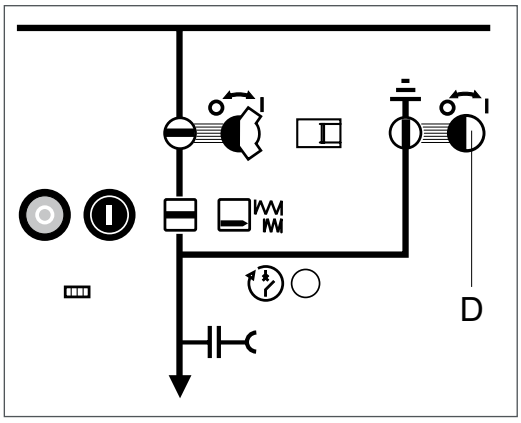


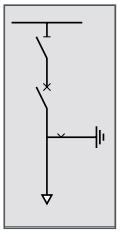


Initial situation

- Circuit-breaker OFF
- Disconnector OFF
- Earthing switch OFF

Fig. 31

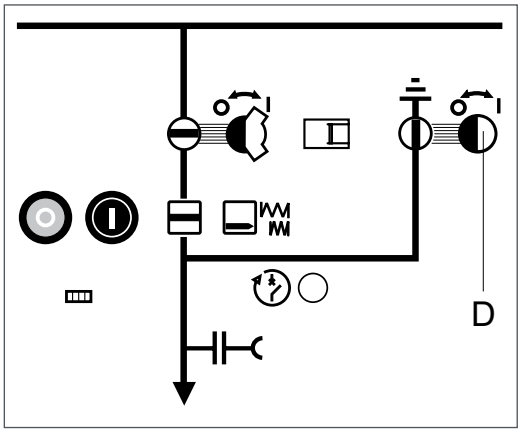


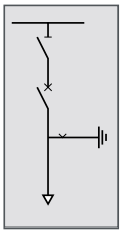


Earth outgoing feeder cable

- Switch earthing switch ON (D).

Fig. 32



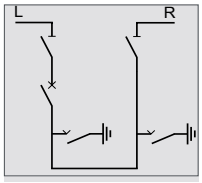


De-earth

- Switch earthing switch OFF (D).

Fig. 33

6.7.3 Connecting busbar sections with bus section coupler



Initial situation

- Circuit-breaker OFF
- Disconnector OFF
- Earthing switch OFF

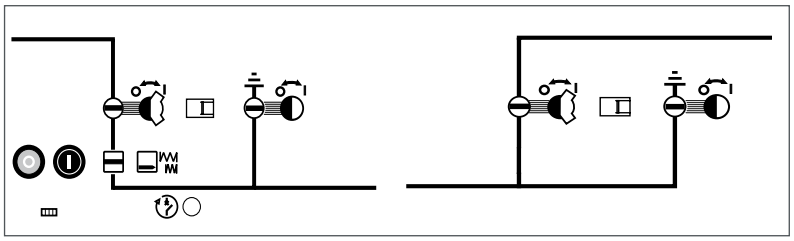
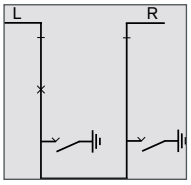


Fig. 34
Initial situation



Connecting busbar sections

- Switch both disconnectors (A) and (B) ON.
- Switch circuit-breaker (C) ON.

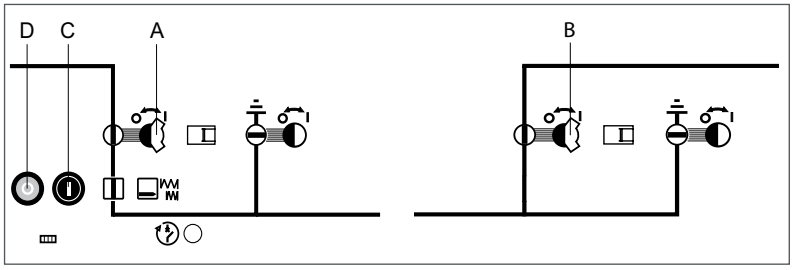


Fig. 35
Connect/disconnect busbar sections

Disconnect busbar sections

- Switch circuit-breaker (D) OFF.
- Switch both disconnectors (A) and (B) OFF.

6.8 Earthing the busbar

Warning!
The disconnectors in the busbar section to be earthed must be in position “OFF” to avoid fauly switching.

Important:
For all switching operations, comply with the interlocking conditions (Chapter) and the operating specifications in Chapter.

6.8.1 Earthing the busbar with earthing device on the cable connection via the circuit-breaker of a feeder panel

The earthing device can be connected to the cable connectors in the cable connection area (earthing adapter required). The earthing device and the earthing adapter are not included in the switchgear’s scope of supplies.

Important:
Comply with the manufacturer’s information regarding the earthing device and the earthing adapter.

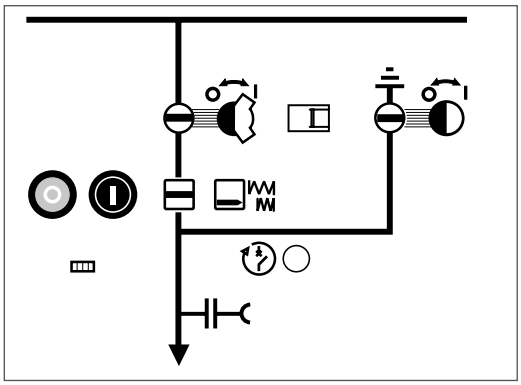
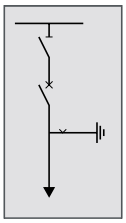


Fig. 36



Initial situation
- Feeder “EARTHED

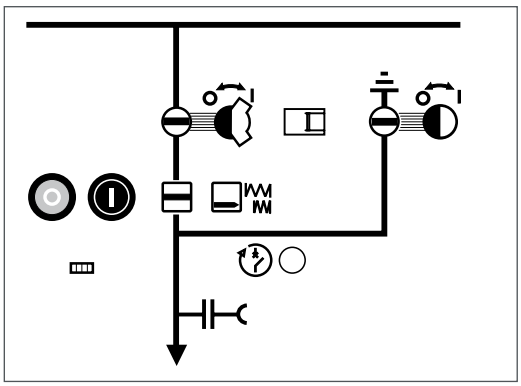
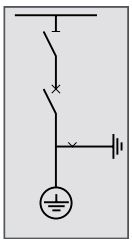


Fig. 37



Connecting the earthing device
- Mount earthing adapter to cable connection.
- Connect the earthing device..

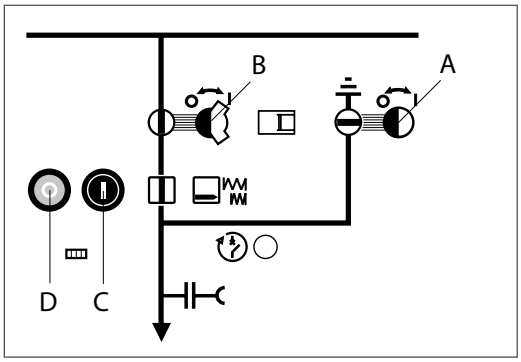
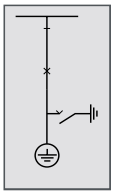


Fig. 38

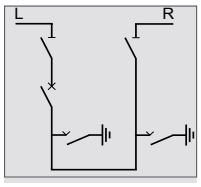


Earthing the busbar
- Switch earthing switch OFF (A).
- Switch disconnector (B) ON.
- Switch circuit-breaker (C) ON.

De-earthing busbar

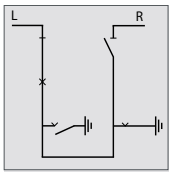
(See Fig. 39)
- Switch circuit-breaker OFF (D).
- Switch disconnector (B) OFF.
- Switch earthing switch (A) ON.
- Remove earthing device and earthing adapter.
- Connect high-voltage cable to cable connection in surge-proof condition.

6.8.2 Earthing the busbar by means of the bus section coupler



Initial situation:
- Circuit-breaker OFF
- Both disconnectors OFF
- Both earthing switches OFF

6 Operation (contd.)



Earth left-hand busbar section (L)

- Switch disconnector - left-hand panel - (A) ON.
- Switch circuit-breaker - left-hand panel - (B) ON.
- Switch earthing switch - right-hand panel - (C) ON.

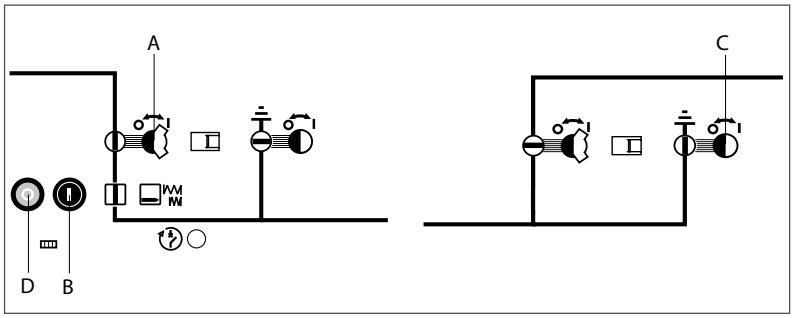
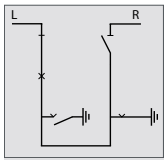


Fig. 39
Earthing/de-earthing left-hand busbar section

De-earthing left-hand busbar section
(See Fig. 39)

- Switch earthing switch - right-hand panel - (C) OFF.
- Switch circuit-breaker - left-hand panel - (B) OFF.
- Switch disconnector - left-hand panel - (A) OFF.

Earthing right-hand busbar section (R)



- Switch disconnector - right-hand panel - (F) ON.
- Switch earthing switch - left-hand panel - (E) ON.

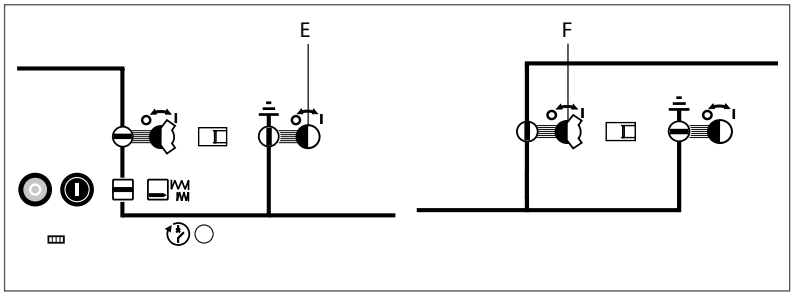


Fig. 40
Earthing/de-earthing right-hand busbar section

De-earthing right-hand busbar section
(See Fig. 40)

- Switch earthing switch - left-hand panel - (E) OFF.
- Switch disconnector - right-hand panel - (F) OFF.

7 Replacement of fuse links

7.1 Selection data for H.V.H.R.C. fuse links

For the protection of distribution transformers, exclusively H.V.H.R.C. backup fuse links with integrated temperature limiter may be used for gas-insulated GMA switchgear.
Due to the temperature limiter, in case of overload of the H.V.H.R.C. fuse links in the presence of

- inadmissible overload currents,
- H.V.H.R.C. fuse links damaged previously

there will be a shut-off by the switch disconnector.

This prevents thermal overloading of the fuse carrier.

Ordering data

The following data must be specified in the Purchase Order:

- Transformer rated power
- Transformer operating voltage
- Rated current of the selected H.V.H.R.C. fuse links.

Selection lists and applicable standards

Selection lists of approved suppliers for H.V.H.R.C. fuses can be provided as required. These selection lists take the following standards and regulations into account:

- Protection of distribution transformers in accordance with IEC 60787, VDE 0670, part 402
- Fuse links in acc. with IEC 60282-1 or DIN 43625 (striker type “medium” with mit max. initial tripping force of 80 N)
- Specifications of IEC 62271-105
- Max. ambient temperature for switchgear: 40 ºC according to IEC 62271-1, identical with max. ambient temperature for the switchgear within the housing of a packaged substation in accordance with IEC 62271-202.
- No transformer operation during an overload condition
- Temperature-rise limits within the switchgear enclosure

7.2 Approved suppliers for H.V.H.R.C. fuse links

The following series made by the H.V.H.R.C. fuse link suppliers offering integrated striker tripping with temperature limiter feature are admissible:

Series	Supplier
H.V.H.R.C. fuse links with temperature limiter	SIBA
H.V.H.R.C. backup fuses with overload protection (temperature limiter)	EFEN
H.V.H.R.C. fuse links, type IKUS, with thermo-striker	JEAN MÜLLER

7 Replacement of fuse links

(contd.)

7.3 Dimensions for fuse links

The GMA switch disconnector panel with fuses has been designed for the following dimensions “D” or “e” of the fuse links:

Type designation	Dimensions “D” or “e” in mm
GMA/12-2/... with adapter 24 kV	292
GMA/24-2/...	442

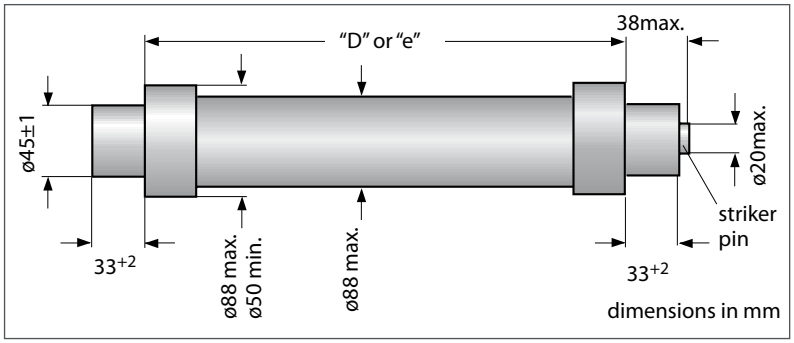


Fig. 41
Dimensions of fuse links

7.4 Use of non-specified fuse links

Warning!
Only H.V.H.R.C. fuse links in accordance with the selection lists have been approved for GMA switchgear panels.
It is essential to consult the switchgear manufacturer before using non-specified fuse links or fuse links made by other manufacturers.

The company operating the switchgear shall be solely responsible for the use of fuse links which are not defined in the selection lists.

H.v. General-purpose fuses

H.v. General-purpose fuses are recommended for the exceptional case in which the switch disconnector is to be equipped with a snap-action drive SFU (instead of stored-energy mechanism SF), so that all-pole fuse tripping is impossible.

7.5 Replacement of fuses

Warning!
Fuse links may be hot! Wear protective gloves.

Important:

- As the earthing switches are arranged upstream and downstream of the fuses, the fuses can be replaced without using insulating equipment.
- IEC 60282-1 also recommends replacing all three fuse links even if only one of the all-pole fuse links in the three-phase system has tripped.

The fuse symbol on the operator interface indicates mechanically if one of the fuses has melted (red marking, Fig. 46, item 1). The switch disconnector is switched OFF automatically by the fuse tripping.

7 Replacement of fuse links

(contd.)

Transformer outgoing feeder without all-pole fuse tripping

If the transformer outgoing feeder is designed without an all-pole fuse tripping, this feature is indicated by an information sign. This sign is located near the fuse symbol on the operator interface.

Important:

Melting of the fuse does not trip the switch disconnector.

In this case, the switch disconnector is equipped with a snap-action drive (SFU) and must be switched OFF separately (manually or electrically, depending on design).

Replacement of short fuse links in switchgear with a fuse dimension of e = 442 mm

GMA switchgear with a rated voltage of 24 kV may also be operated with an operating voltage of 12 kV. An adapter is available to enable the use of an H.V.H.R.C. fuse link with the standard dimension for 12 kV, dimension “e”=292 mm for a fuse dimension of “e”=442 mm.
The fuse links are not included in the scope of supply.

Replacement of fuse kits:

- Clean contact surfaces (brand-new fuse link, adapter and grip end) using a non-fibrous cloth, in case of severe soiling, use a cleaning product. Apply a thin and uniform film of lubricant KL, clean and grease.
- Introduce the brand-new fuse link with contact strip with striker into the grip end contact by turning it slightly. Secure fuse link from being removed by tightening clamping screw in the grip end. Fasten the adapter on the opposite contact end of the fuse link without striker.

Fig. 42
Attachment of fuse link grip end

Fig. 43
Lock “cam” on the grip end in the recess of the insulating tube

Fig. 44
Assembly of short fuse links

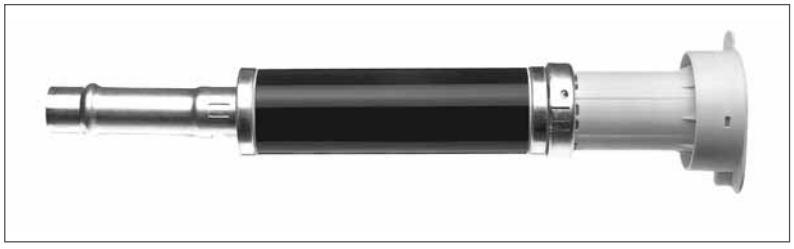


Fig. 45
Assembly of short fuse links

7 Replacement of fuse links

(contd.)

Description of the steps for fuse replacement:

- Switch the earthing switch ON.
- Unlock the fuse with cover and open compartment double-bit key.
- Fold fuse compartment cover forward and down, and remove it.
- Pull grip end with fuse link out without turning it.
- Remove grip end with fuse link using both hands.
- Release clamp screw in the grip end.
- Pull fuse link out of the grip end by turning it slightly.
- Prepare fuse link for insertion.

  □ Clean contact surfaces on the grip end and on the brand-new fuse link using a non-fibrous cloth, in case of severe soiling, use a cleaning product.

  □ Apply a thin and uniform coat of lubricant KL

  □ Introduce the contact end with striker of the brand-new fuse link into the contact of the grip end by turning it slightly.

  □ Secure fuse link from being removed by tightening clampscrew in the grip end.
- Push grip end with fuse link inwards without turning it.
- The “cam” on the grip end must engage in the recess of the insulating tube (see Fig. 43).
- Reinsert fuse cover, close it using the double-bit key, and lock it. Press interlocking slide (3) down

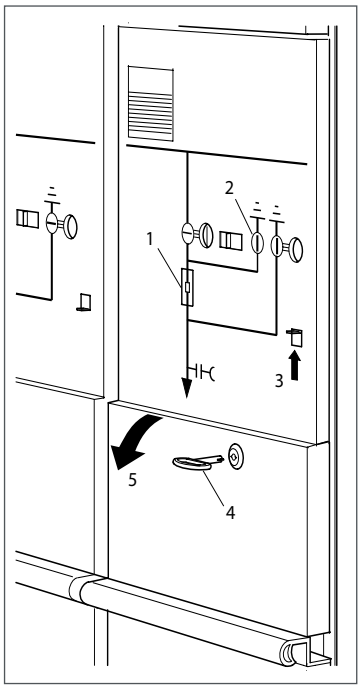


Fig. 46
Replacement of fuses
1 Fuse tripping indicator (red)
2 Earthing switch ON
3 Unlock fuse cover
4 Double-bit key for opening
5 Fold fuse shutter forward, and remove it

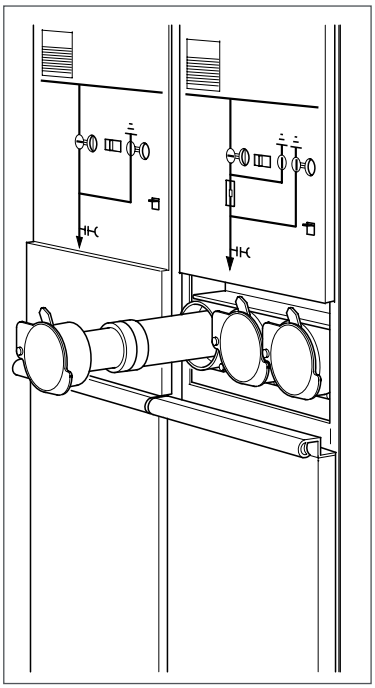


Fig. 47
Removing the fuse link

7 Replacement of fuse links

(contd.)

Checking the all-pole mechanical fuse tripping

We recommend checking the all-pole mechanical fuse tripping with the switch disconnector in position “ON” after replacing the H.V.H.R.C. fuse links.

The all-pole mechanical tripping can be checked via the tripping linkage using the tripping pin Ø ≤ 2.1 mm, L>80 mm, which is pushed as far as it will go through the insertion port of the fuse link cover.

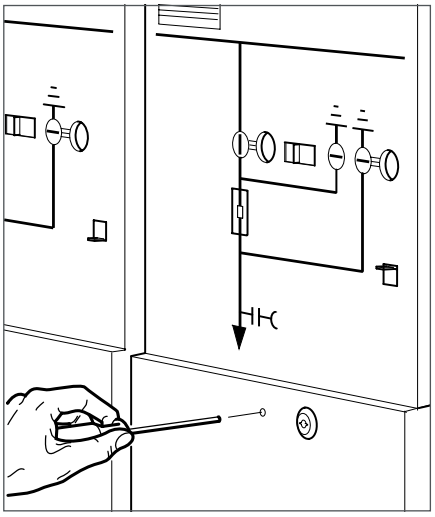


Fig. 48
Checking the all-pole mechanical fuse tripping

8 Disconnecting the voltage transformer

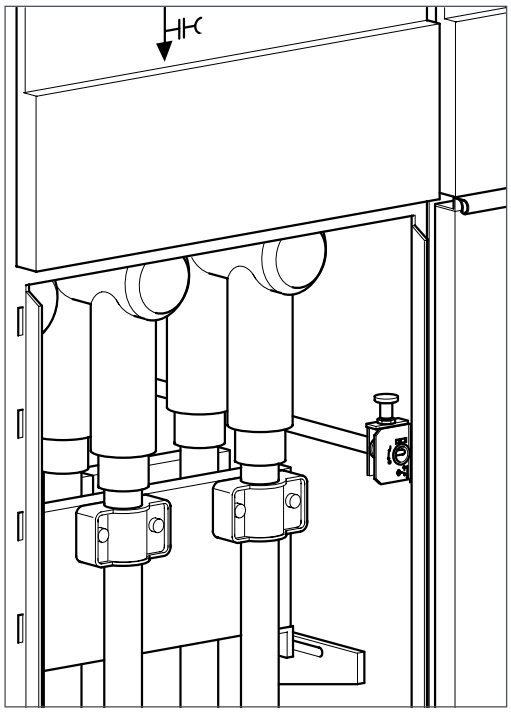


Fig. 49
Disconnecting device for voltage transformer

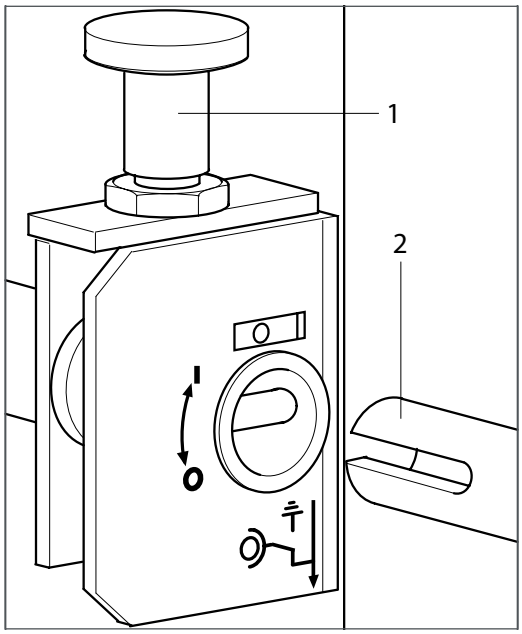


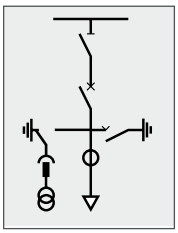
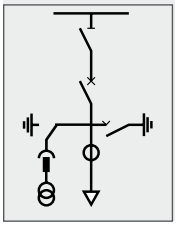
Fig. 50
Disconnecting device for voltage transformer and insertion port.
1 Lock pin
2 Detachable lever

8.1 Disconnecting device for the voltage transformer in the outgoing feeder cable

Warning!
Disconnecting devices for voltage transformers can only be actuated in de- nergized condition. Make sure that the outgoing feeder cable is de-nergized on all accounts.

Actuate disconnecting device:

- Isolate outgoing feeder cable from the power supply and earth it; see page 28.
- Remove cable compartment cover (see Assembly Instructions).
- Insert detachable lever for earthing switch (2) into its insertion opening.
- Pull the lock pin (1).
- Swing detachable lever (2) speedily as far as it will go (to its stop) to I (ON) or O (earthed) position (approx. 95°).
- When end position is reached, the lock pin must latch again.
- Pull detachable lever off after switching operation.
- Insert and lock cable compartment cover (see Assembly Instructions).

O (earthed)	I (ON)
	

8 Disconnecting the voltage transformer (contd.)

Disconnecting device for voltage transformer on the busbar

Warning!
Disconnecting devices for voltage transformers can only be actuated in de-energized condition. Make sure to isolate the busbar in any case from the power supply.

Actuate disconnecting device:

- Isolate busbar from the power supply.
- Remove cover from instrument recess.
- Insert detachable lever for earthing switch (2) into its insertion opening.
- Pull lock pin (1).
- Swing detachable lever (2) speedily as far as it will go (to its stop) to
- I (ON) or O (earthed) position (approx. 95°). When end position is reached, the lock pin must latch again.
- Check position indicator (O or I).
- Pull detachable lever off after switching operation.
- Remount cover of instrument recess.

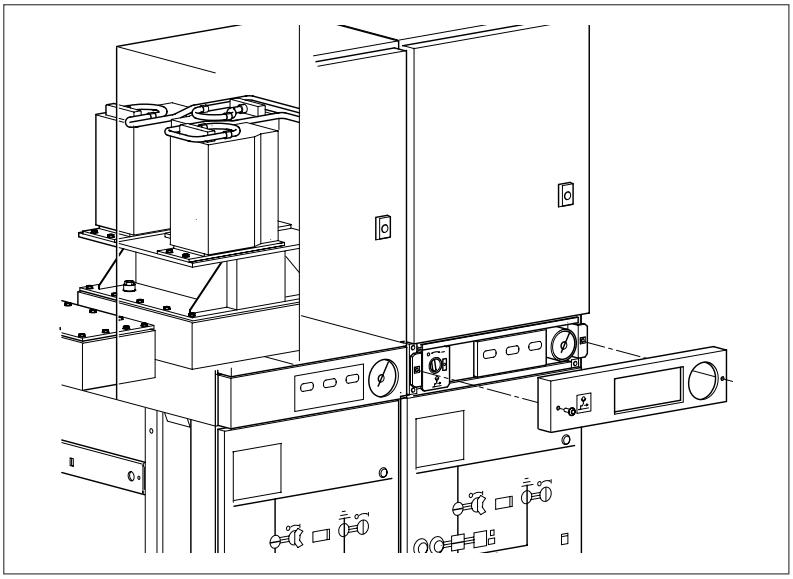


Fig. 51
Removing the cover from the instrument recess.

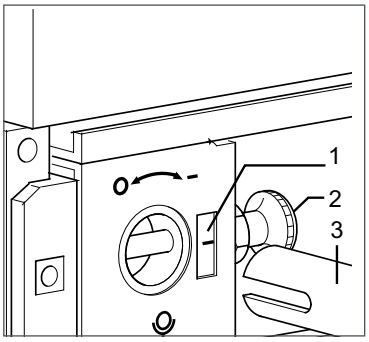


Fig. 52
Switching the voltage transformer OFF
1 Position indicator reads:
Voltage transformer OFF (O)
2 Lock pin
3 Detachable lever

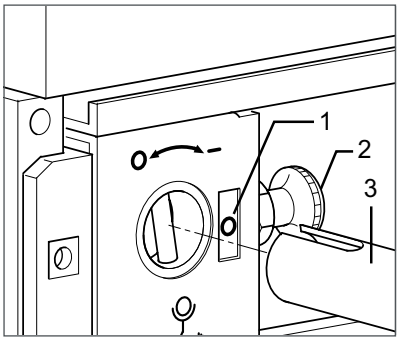


Fig. 53
Switching the voltage transformer ON
1 Position indicator reads:
Voltage transformer ON (I)
2 Lock pin
3 Detachable lever

9 Maintenance

9.1 Safety provisions

Only specialist electricians certified by the manufacturer for maintenance work and who have the required knowledge regarding handling of GMA series medium-voltage switchgear are permitted to perform maintenance and cleaning work.

Warning!
Refer to the safety provisions on page.

9.2 Maintenance schedule

We recommend performing a visual inspection of the panels at least every four years, depending on the strain to which they are subjected during operation and on the operating conditions.

Important:
In case of humidity and condensation or air pollution (dust, smoke or corrosive gases), the maintenance intervals must be adapted to the actual conditions. In case of ambiguities or irregularities, please contact the manufacturer's Service Center immediately.

Insulating gas:

GMA series panels have a hermetically sealed pressure system in accordance with IEC 62271-200. It does not require servicing over its entire service life.

Switching devices:

The components in the cladded high-voltage parts of the panel (vacuum circuitbreaker, disconnector and earthing switch) do not require any maintenance either.

Gas tank:

The pressure tanks are made of stainless, non-magnetic steel.

Warning!
Neither drill holes into nor open gas tanks. Risk of loss of insulating gas.

Drive mechanisms / covers:

Drive mechanisms and covers outside of the enclosure are corrosion-protected with lasting effect. Damage to the paint, scratches and deterioration must be repaired immediately to avoid corrosion.

Mantainance interval	Work to be carried out	Qualification / Work performed by
at least every 4 years or depending on the actual ambient conditions	■ Visual inspection of the switchgear panels ■ If necessary, clean the panels and perform switching tests of the drives (see page 40).	Staff certified accordingly for the work to be done
after 20 years	■ Grease drives and perform switching tests (see page 40). ■ Check releases/blocking coils	
■ once the max. admissible number of breaking operations for the switching devices has been reached (see page 42) ■ 1000 mechanical operations of the disconnector or the earthing switch	Please, contact the manufacturer	Manufacturer's Service Center

9.3 Cleaning

When deposited dirt and humidity are detected, the panels must be cleaned in an expert fashion.

When performing cleaning, make sure that the lubrication in the drive mechanisms is not removed. If the drive mechanisms are no longer sufficiently lubricated, new lubrication must be applied.

Warning!

Risk of injuries: The drives must not be disassembled for service and maintenance work.

Slight contamination

Clean using a dry, lint-free cloth. Depending on the degree of soiling, replace cloth as often as necessary.

Severe soiling

Use cleaning agent, 1 litre can (see page 43). The use of other cleaning agents is not admissible.

- Wear protective gloves
- Use cleaning agents according to manufacturer‘s instructions
- Soak the cloth thoroughly and wipe the insulating components. Keep duration of exposure as short as possible.
- Expose the cleaned surface to the air for at least two hours.

9.4 Corrosion protection

Drive mechanisms and covers have a long-term protection against corrosion.

Any damage to the paint, scratches and other damage must be repaired immediately to avoid corrosion.

Contact the manufacturer’s Service Center.

9.5 Replacement of components and panels

The drive mechanisms, current transformers and voltage transformers as well as the testing and monitoring systems can be replaced if necessary. Also, entire modules can be replaced.
The following data on the nameplate are relevant for replacement of components or modules or in case of any queries (see also page 6):

- Type designation
- Serial number
- Year of construction

Should you have any queries regarding replacement of components or panels, please contact the manufacturer’s Service Center.

9.6 Lubrication instructions

Maintenance work may only be performed by specialists who are familiar with the installed switching devices and drive mechanisms they use.
The switching devices and drives must not be disassembled for service and maintenance work.

Warning!
Refer to the safety provisions on page.
The closing and opening springs must be released!

Removing operating cover

Once the operating cover has been removed, the drive is accessible from the switchgear front end. Refer also to the Assembly Instructions.

- Remove the bolts (4 ea.) from the operating cover.
- Remove the operating cover by lifting it forward.

Remount operating cover by reversing the above sequence once maintenance is finished.

Points of lubrication:

The drive is completely lubricated at the factory with lubricant KL.

All surfaces and joints in the circuit-breaker, disconnector and earthing switch drives which are sliding on each other must be lubricated.

Important!
The following elements must not be lubricated:

- Motor
- Ball bearings
- Auxiliary releases
- Push switches
- Blocking coils
- Auxiliary switches

Lubrication procedure

- Lubricant KL for surfaces sliding on each other. Clean lubricating points, e. g. using a lint-free cloth or a soft paint-brush and cleaning agent (use sparingly, just moisten points of lubrication). Apply a thin coat of lubricant (using e.g. a paintbrush).
- Liquid lubricant FL for bearings, joints and guide systems. Pour drops of liquid lubricant (oil can, drip feed lubricator) into the bearing gap. Liquid lubricant gets between the bearing surfaces due to the capillary effect. In case of inaccessible lubrication points, use an extension tube or spray.

9.7 Admissible number of breaking perations

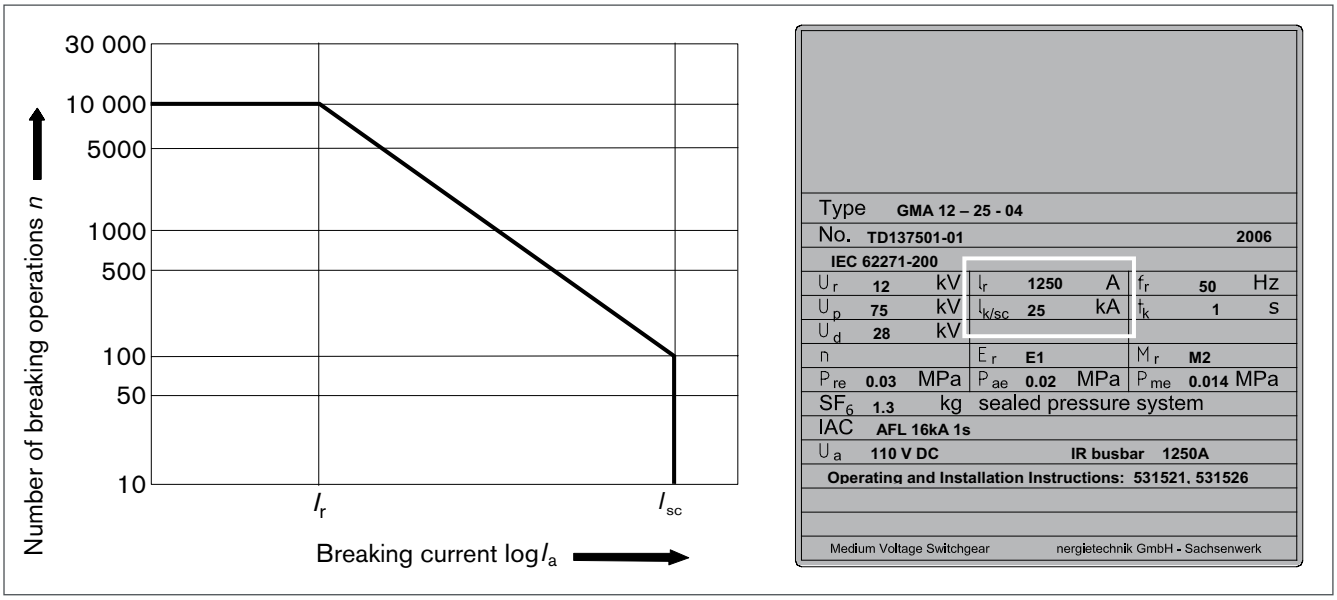


Fig. 54

Circuit-breaker
I_r = Rated (normal) current [A]
I_{sc} = Short-circuit breaking current [kA]
The diagram defines exclusively the maximum admissible numbers of breaking operations of the circuit-breaker as a function of the rated normal current Ir and of the short-circuit breaking current Isc.
The data for the rated normal current Ir and the short-circuit breaking current Isc are indicated on the nameplate.

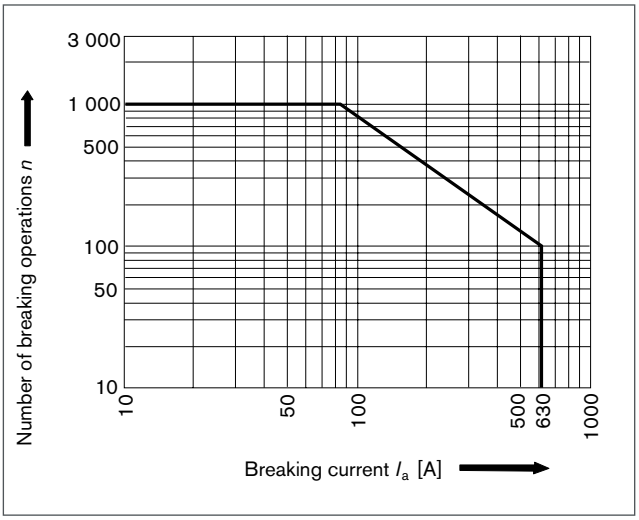


Fig. 55
Switch disconnector without fuse.
Rated normal current 630 A

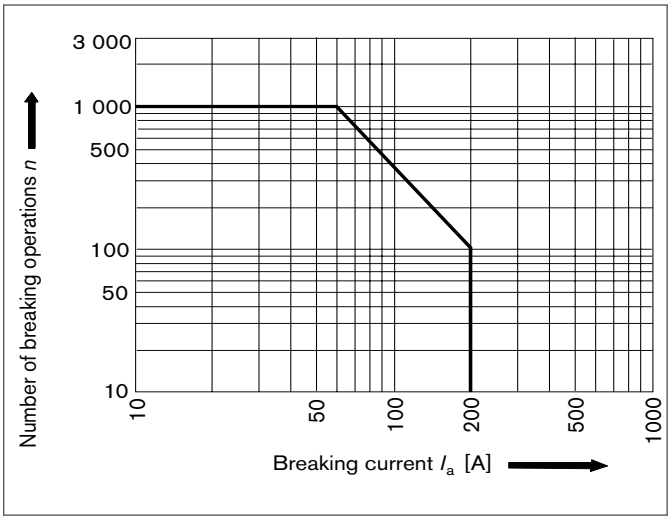


Fig. 56
Transformer feeder with switch disconnector / fuse.
Rated normal current 200 A

10 Annex

10.1 Auxiliary products

Only the following auxiliary products may be used, which can be purchased from the manufacturer. The use of other auxiliary products is not admissible.

Warning!
Risk of injury if the auxiliary products are handled improperly. Comply with the safety data sheets of the auxiliary products.

Auxiliary product	Ref. no.
Cleaning agent, 1-l can	S 008152
Lubricant KL, 0.5 kg can	ST 312-111-835
Liquid lubricant FL 0.5-l can	S 008 153
Touch-up pen RAL 7044 silk-grey, 50 ml	S 009 561
Touch-up pen, special paint(specify colour shade)	S 009 562

10.2 Operation accessories

Important:
These accessories are supplied together with the panel. The panel may only be operated by means of these accessories.

Accessories	Ref. no.
Detachable lever for switch disconnector and disconnector	AGS C26 267-01
Detachable lever for earthing switch and voltage transformer disconnecting device	AGS C01 133-01
Double-bit key for low-voltage compartment and for opening/closing the fuse cover	AGS 434 101-01
Crank to charge the energy-storing device	AGS 617 831-01
Tripping pin to check 3-pole fuse tripping	AGS 085 562-01

Notes

© 2011 Schneider Electric - All rights reserved

Schneider Electric
35, rue Joseph Monier
CS 30323
92506 Rueil-Malmaison Cedex, France

RCS Nanterre 954 503 439
Capital social 896 313 776 €
www.schneider-electric.com

As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

This document has been printed on ecological paper

Publishing: Schneider Electric
Design: Schneider Electric
Printing:

AGS 531 521-01

02-2011